THE

ELECTRICAL REVIEW.

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ELECTRICAL REVIEW.

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NOW READY.

THE

UNIVERSAL ELECTRICAL DIRECTORY

(J. A. BERLY'S).

1909 EDITION

H. ALABASTER, GATEHOUSE & CO.,

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SPEED INDICATORS FOR ELECTRIC TRAMWAYS.

A CIRCULAR has been issued by the Board of Trade to the tramway undertakers of the country recommending that a certain proportion of the cars on each system shall be fitted with speed indicators to enable drivers to be trained in judging speeds. The Board of Trade has reason to think that the maximum speeds fixed by its regulations are frequently exceeded, but, in view of the difficulties which are connected with the introduction of speed indicators, the Board does not at present consider it advisable to require them to be fitted to all cars.

For many years one of the Regulations of the Board of Trade required the owners of a tramway on which the cars were worked by mechanical power, to fit speed indicators on each car, but the active and tacit opposition to this requirement led to its becoming a dead letter. It was, in fact, still-born.

Now that the futility of trying to make vehicular traffic safe by fixing a maximum speed has been brought home to most of us by the failure of the 20 miles per hour law for motor-cars, we shall not be convinced easily that the general introduction of speed indicators as a check on the maximum speed of tramcars would be effective, and it is with much pleasure that we note the Board's refusal to go all the way with the extremists who are to be found eagerly counselling cure by law for every exaggerated irregularity.

Neither are we inclined to withhold approval of the recommendation quoted, for, without doubt, drivers are, as a general rule, devoid of any idea of speed, and anything which will tend to help them to appreciate how much faster they are travelling than they suppose, will go some way to remove the dangers which lurk on steep hills, and long but not necessarily steep grades. In many instances the maximum speed allowed at certain parts of a line by the Board of Trade is 4 M.P.H., but it is only on the rarest occasions that the speed of an electric car is brought as low as that, not because all the drivers desire to break rules, but simply because they do not realise that they are travelling too fast.

A good training with a speed indicator in his sight and consciousness all the time ought to produce in the driver in course of time a special sense of speed, and when that occurred his sub-conscious self would take the place of a material indicating instrument.

No manager really wants his cars to run at dangerous speeds, although most of them have winked—reprehensively, no doubt—at an occasional rush to make up time after some delay, and if they could get out of their minds the idea that the Board of Trade would make unpleasant uses of the instruments, they would welcome the addition of a speed indicator to the equipment, not only of a certain percentage, but of the whole of their cars.

We can conceive a most regular and safe service being run over a line upon which the approximate speed to be observed is painted on the poles at frequent intervals, and every driver regulates the speed of his car with the assistance of the indicator.

Under such circumstances, it would not be easy for the manager deliberately to allow the drivers to exceed the *maxima* permitted by the B. of T., and it is the knowledge of that fact which stands in the way of an extensive optional use of speed indicators. In this matter our sympathy is with

he managers, and will be for just as long as the B. of T. seeks to limit in an arbitrary manner the speed which cars may run along such portions of a line as do in themselves hold the possibility of danger. That is to say, we think it absolutely necessary for the safety of the public that maximum speeds should be fixed at places where there is a chance of cars being derailed or getting out of control, as, for instance, at facing points or on long or steep hills, but we take exception to a maximum being imposed just for the sake of the prohibition. The law relating to the reasonable and safe use of a public road by drivers of any vehicle is all that is required in this case, and it is as unreasonable to limit the speed of a tramcar under all circumstances to 16 M.P.H. as it is to prohibit motor-cars being driven beyond 20 M.P.H.

Although, as we have said, no manager will allow his cars to be run at speeds which will endanger them or the public, he will, if he is worth his salt, keep on raising the speed on those stretches of line over which it is only necessary for the drivers to exercise the common precautions which are taken by drivers of all swiftly moving or ponderous vehicles, until the limit of commercial economy is reached for the time being, and it is difficult to imagine any line in the United Kingdom on which there is not good scope for exceeding consistently and by large margins the arbitrary limits set by the B. of T.—limits often as low as 12 M.P.H., and never exceeding 16 M.P.H.

But remove this maximum rule, and we should see the difficulties which are said now to prevent speed indicators being fitted to all cars fade away mysteriously, and the country would be none the worse for it.

A Policy of Pin-Pricks.

We have received from a correspondent a letter written to a consumer by the Metropolitan Electric Supply Co., which raises, in a concrete form, the question of the policy to be adopted by supply undertakers towards the users of metallic-filament lamps. The Company points out that its Act of Parliament prescribes that one month's notice must be given before any change can be made by the consumer in the maximum power of his supply, and that he must bear all expenses connected with the inspection of his installation and change of meter, &c.—such expenses amounting to from £1 to £2. Further, the Company withdraws the special rate for basement lighting.

From this letter, and the rules prescribed by the Company for the installation of auto-transformers, which are drawn up on the same lines, and also demand particulars as to the type, power factor at no-load, magnetising current, &c., of the transformer, it would appear that the Company intends to place obstacles in the way of the introduction of the auto-transformer for the purpose of supplying metallic-filament lamps at low voltage.

As frequently happens in connection with Acts of Parliament, when contingencies arise which were unforeseen at the time of drafting the Bills, the wording assumes a different meaning, and acquires force in unexpected directions. In this case the intention was apparently to prevent increase in the maximum demand without due notice, to enable the supplier to put in a new meter of corresponding capacity; this clause is now utilised in a contrary sense—to hinder diminution in the maximum demand. As the meter must be chosen in accordance with the demand, in order to ensure accurate readings, we do not question the justice of the Company's stipulation for due notice; a small charge for inspection and change of meter is not unreasonable, though the sum stated is apparently excessive; and the Company may be within its rights in asking for technical data as to the transformer. But we have very grave doubts as to the wisdom of the obstructive policy which seems to be behind the Company's action in the matter.

At the moment one cannot withhold sympathy from the suppliers of electricity, who are faced with the possibility, or probability, of a reduction of output for a time; but how are they going to reverse the tendency—by alienating existing consumers, or by accepting the situation, and boldly embarking upon a campaign in favour of the new lamps That the latter will eventually come into universal use cannot be doubted. What is the good of trying to stem the tide? Surely it were far better to utilise the undeniable advantages of the metallic-filament lamps for the purpose of combatting the common foe, and winning from the gas suppliers compensation—and more than compensation—in the shape of thousands of new consumers.

The Brompton and Kensington Electricity Supply Co. has also issued what appears to be a manifesto against the use of auto-transformers, though not, apparently, against metallic-filament lamps, for it is stated that these will shortly be available of low candle-power for normal pressures, and that a 16-C.P. 100-volt metallic-filament lamp "is already on the market" (?). This Company, however, after throwing cold water on the transformer idea, offers to supply the apparatus at a small additional rent. Where the wiring contractor supplies the transformer, the Company claims that it must be submitted for testing and approval. We take it that notice of the installation of the transformer is sufficient "submission." The rights of the supply undertaker do not extend beyond the consumer's terminals, and he cannot prescribe any particular type of lamp or otherwise interfere with the manner in which the electricity supplied is used by the consumer, provided that the latter does not use it in such a way as to interfere with the supply to other consumers; and if the insulation resistance of the installation is up to the standard prescribed by law, the undertaker cannot refuse to supply. It is clear, therefore, that, if consumers choose to use auto-transformers, the suppliers are powerless to prevent them from doing so; and we should think that the wiser policy for the suppliers to follow would be to look to the future and to utilise the possibilities of the new lamps to the utmost instead of hindering their adoption.

Flexibles and Switch Lampholders.

In our leading article last week we dealt with Mr. Swinburne's report on the Proposed Home Office Regulations, and near the close of this article we said: "It must be borne in mind, however, that this regulation [the Regulation referring to flexible conductors] will now apply only to portables carrying more than 250 volts, and not to portable lamps and other apparatus on the ordinary voltages of domestic supply." It has been pointed out to us, however, that the amended Regulation 13 bears a somewhat narrower interpretation than the one we put upon it, and we agree that the literal rendering of the Regulation as it now stands may be interpreted to cover all flexible pendants with switch lampholders, and all flexibles on portable apparatus on alternating currents of any voltage whatsoever, or on direct-current circuits carrying pressures above 150 volts.

We should like to point out that, before dealing in detail with the Regulations, we had carefully read Mr. Swinburne's report, and our interpretation of the rules was therefore largely influenced by the spirit underlying the Commissioner's recommendations. The impression conveyed by the report was that the Commissioner considered the proposals of the Home Office to reduce the safe voltage from 250 to 130 to be unnecessary and unjustifiable, and that he had recommended generally the retention of the old Board of Trade limit of 250 volts as the safe limit. To make our meaning clear, we give an extract below from Mr. Swinburne's report:—

> I have no doubt that very low pressures—namely, pressures not higher than 65 alternating or 130 direct—can produce death in the case of normal and healthy persons if applied so as to give very perfect electrical contact. On the other hand, it is very unlikely that anyone would make a good enough contact unless he did so on purpose, and took some trouble to do it. The conditions which lead to greatest danger from exposed conductors are wet hands, and wet feet on wet, damp or metallic floors. In cases where the floor is dry, a dangerous shock can be obtained only by making a good contact with both hands. Where the workman's hands are likely to be dry or oily, the danger is further reduced. It was urged that a slight shock might give rise to a serious accident, because it might cause a man to jump away and fall off a platform or fall against something dangerous. In my opinion, this is too remote a chance to consider, and the really important matter is death caused directly by shock. Direct non-fatal injury by shock

need not be considered, as a man is generally either killed through being unable to let go, or merely startled.

The exemption as drafted would give practically no relief, as there are no important alternating current supplies under 65 volts, and there is very little direct-current work under 130, and that is mostly getting obsolete. That is not a valid reason for enlarging the exempted region, however. The limits are really a question of compromise between danger on the one hand and expense and hindrance to the industry on the other, and in my opinion the proposed limits are too low.

What the limit should be depends on circumstances. A badly kept factory with damp floors, or even a well-kept motor garage with hand lamps and flexibles, where the floors are of necessity often wet, is more dangerous than an ordinary generating station.

Keeping the above well in mind whilst reading the following additional regulation recommended by the Commissioner, we think that one is justified in assuming that the recommendation as to switch lampholders and special earthing wire in connection with portable apparatus was intended to apply only to pressures above 250 volts or to special conditions when the voltage was below the low-pressure limit.

In all cases where the person handling portable apparatus or pendant lamps with switches, for alternating current or pressures above 150 volts direct current, would be liable to get a shock through a conducting floor or conducting work or otherwise if the metal work of the portable apparatus became charged, the metal work must be efficiently earthed; and any flexible metallic covering of the conductors shall be itself efficiently earthed and shall not itself be the only earth connection for the metal of the apparatus. And a lampholder shall not be in metallic connection with the guard or other metal work of a portable lamp.

In such places and in any place where the pressure exceeds low pressure, the portable apparatus and its flexible wire shall be controlled by efficient means suitably located, and capable of cutting off the pressure, and the metal work shall be efficiently earthed independently of any flexible metallic cover of the conductors, and any such flexible covering shall itself be independently earthed.

Whilst we cannot but think that it was the Commissioner's intention to apply this special regulation to special circumstances where there was an obvious danger of shock from the handling of apparatus or switch-holders, there is certainly room for doubt as to the method in which the regulation will be generally interpreted by the ordinary Home Office Inspector who has little or no electrical knowledge.

If a Home Office Inspector considers that there is a danger of shock to any person using a portable apparatus, or switching on a light by means of a switch lampholder, then such portable apparatus or such lampholder must be earthed by means of a third conductor. Now this would involve, in many cases, running an earthing wire throughout the whole installation alongside the conductors. In the case of a screwed piping installation it might be satisfactory to connect the earth wire to the conduit or to the metal ceiling-rose box; but in a wood casing, or in a slip-joint conduit installation, a third wire would, no doubt, be insisted upon. In a great majority of existing installations this would be almost impossible without entirely rewiring the installation.

The rules will be issued without Mr. Swinburne's report to qualify them, and it will be open to any inspector to condemn switch-holders and flexibles indiscriminately under this regulation if used on alternating-current circuits of any pressure whatsoever or on direct-current pressure exceeding 150 volts. This we should consider is going far beyond the spirit of the recommendations. It is essential, therefore, that before the regulations are put into force the wording of Regulation 13 regarding flexibles should be so altered as to specify clearly and distinctly under what circumstances the limitations of 150 volts direct current and all alternating voltages apply. Our readers must lose no time in expressing their views upon this, as when once the rules are put into operation, non-compliance therewith will become a punishable offence, so that it is necessary that any ambiguity should be at once cleared up.

The Surface-Contact System of Electric Traction.

RECENT occurrences have done a good deal to strengthen the opinion, which we helped to form, that the adoption of the surface-contact system is not warranted save in very exceptional circumstances. The Lorain system is being retained in Wolverhampton because there is no alternative from financial reasons, the Dolter system is being thrown out because it had become intolerable, and the "G. B." in London is passing through a time of trial.

Call the system by whatever name you like, it has not been the instantaneous success that the overhead system was, in spite of obvious defects of the latter. But it would be childish folly on our part to say that no surface-contact system can work properly, and with a reasonable degree of safety. We never have said so, and we certainly could not say so now, since the Wolverhampton lines have given such good results from a merely operative standpoint, and the Lincoln tramways, as shown by Mr. Clegg's paper, abstracted elsewhere in this issue, have been successful on practically all points. We still believe, however, that there are few towns which would not be better served by an overhead system than by a surface-contact system. Even when a perfectly satisfactory surface-contact system is obtained, a difficulty must always remain which is well exemplified in the case of Wolverhampton. For some considerable time after the Wolverhampton town tramways were electrified on the Lorain system they were cut off entirely from the rest of the world, although strenuous efforts were made by the company which worked the external tramways to keep the old links in being, and to forge others. Finally this end was attained, and at very considerable expense the company equipped a sufficient number of its trolley cars with the cumbrous and wasteful skate apparatus, while the Corporation for a comparatively trifling sum fitted trolleys to an equivalent number of cars, and intercommunication was re-established, to the joy of everyone except the engineering staff of the company, who had to keep the new skate equipments in repair. Within the last few weeks the *status quo ante* has been resumed, as the company has found the services unremunerative because of the difficulties encountered. The inhabitants of Wolverhampton, therefore, find themselves much worse off in the matter of tramway service than they were in the days of the steam tramway, for they cannot leave their boundaries without changing cars.

Contracts by Telephone.

IN the hurry and bustle of modern commercial life, business men often make contracts involving considerable sums of money through the telephone. But it is not wise to trust entirely to this means of communication. In the first place, no witness can, as a rule, be called to give evidence of what passes; a man's own clerk, unless he is provided with a separate receiver, cannot hear what the person at the other end is saying. In the second place, the conversation by which it it sought to bind principals, may have been conducted by persons having no authority. Finally, the person receiving a message may forget to record its exact terms in the office diary, and memory is as fickle as the wind. In a recent case which was heard by him at the City of London Court, Judge Rentoul had something to say with regard to the validity of contracts made by telephone, and not subsequently confirmed by writing. It appeared that a Glasgow firm had made a contract to buy 500 tons of goods from a London firm, in instalments of fifty tons a month at £13 per ton. When the deliveries were completed, the defendants had over-delivered five tons, and as the market price had fallen to £9 14s. per ton by that time, the plaintiffs demanded the return of £24 overpaid. The London firm alleged that they agreed over the telephone with the plaintiffs' London office to make the allowance only if future business resulted, but it had not. The plaintiffs said that this was the first they had ever heard of such an agreement, and denied that they were bound by it. Judge Rentoul said he would hesitate a long time before he held a man bound by the words that came over his telephone. Every contract made in that way ought to be confirmed by writing, if it was liable to any doubt, before it was upheld by a Court of law. If it were merely proved that a message had proceeded from a man's telephone in his office without any proof of who sent the message, he did not think it could be held that the firm was bound by any such statements. While there is reason for thinking that some of his Honour's observations are a little too wide, the decision emphasises the necessity of persons reducing telephone conversations to writing.

D

DIRECT TELEGRAPHIC COMMUNICATION BETWEEN ENGLAND AND INDIA.

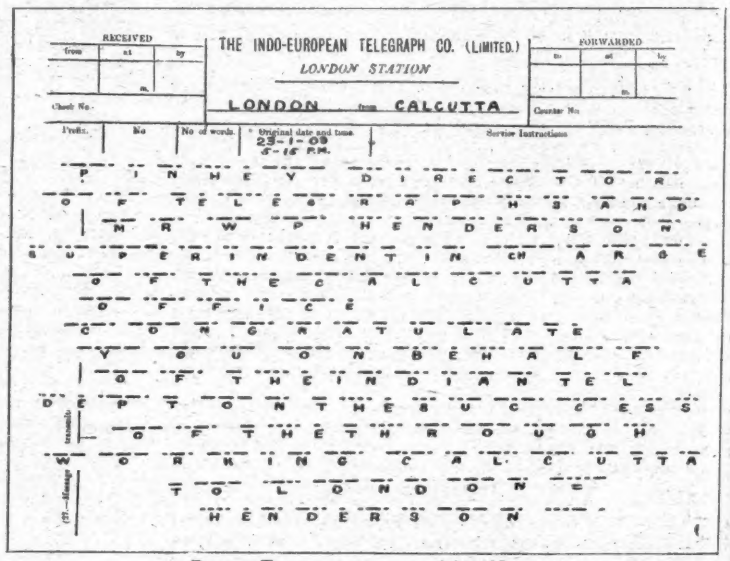
A MOST interesting demonstration of the practicability of telegraphic communication over very long overland telegraph lines was given at the Indo-European Telegraph Co.'s offices in Old Broad Street, on Saturday evening, January 23rd.

As already described in the ELECTRICAL REVIEW of January 20th, 1905, the Indo-European Co.'s line from London passes to Lowestoft, then by submarine cable to Germany, through Emden and Berlin to Russia, through Warsaw, Rowno, and Odessa to Kertch, where the company has three submarine cables across the straits; thence it passes through Tiflis and Tabriz to Teheran, the capital of Persia, which, until Wednesday, January 20th, was the terminus of the Indo Co.'s circuit.

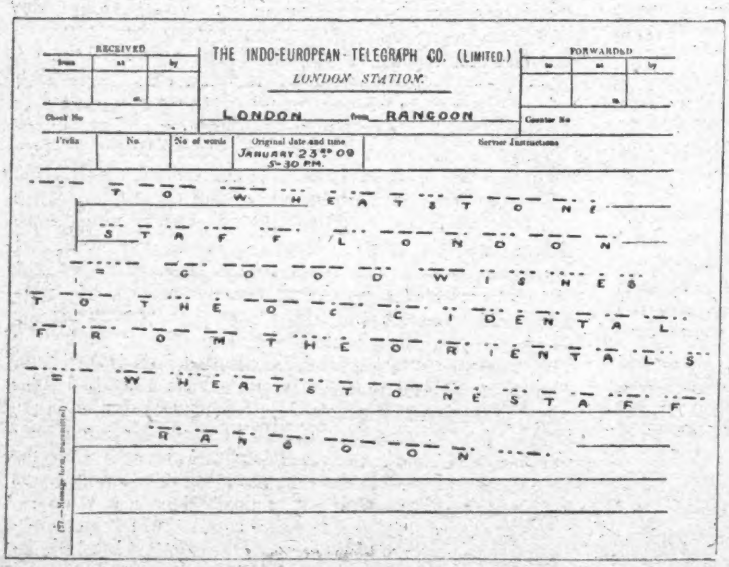
In December, 1902, the construction of a new line from Teheran to Kurrachee was taken in hand, and has been completed, making the terminus of the Indo Co.'s line on Indian territory. The new line increases the total length of circuit from 3,800 miles to 5,374 miles. This extension of 1,574 miles has entailed the provision of three additional repeater stations, one at Teheran, another at Kerman, and the third at Panjur in Beluchistan.

All messages between England and India passing over this route will be received direct without re-transmission, there being now thirteen automatic repeaters in the circuit. As an illustration of what could be done when required, various line extensions were added to the circuit by other automatic repeaters, and direct communication was thus obtained at a speed of about 40 words per minute with Madras, and later with Calcutta and Rangoon.

In the case of the last two stations, the total lengths of circuits over which the messages passed were 6,900 miles and 7,700 miles respectively. Both these distances constitute records for direct telegraph working; we have therefore given illustrations of two messages actually received, as they will no doubt prove of great interest to our readers.



DIRECT TRANSMISSION OVER 6,900 MILES.



DIRECT TRANSMISSION OVER 7,700 MILES—THE RECORD.

CORRESPONDENCE.

Letters received by us after 5 P.M. ON TUESDAY cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.

London County Council Turbines.

Now that it appears that most of the parties directly or indirectly interested in the above matter have said their say, pardon me if I first of all draw your attention to the fact that Messrs. The British Westinghouse Electric Manufacturing Co., in their reply letter (ELECTRICAL REVIEW, December 25th) are apparently labouring under an unjustifiable mistake in believing that I object to their having succeeded in obtaining the contract. I think, against this, I cannot put forward a better argument than stating that I have not even quoted for the job.

To my mind, one point stands out firm, viz., the undoubted and positive triumph of the impulse turbine over the reaction turbine; all the more so, as the British Westinghouse Co., who have hitherto been staunch fighters in the cause of the latter type of machine, have been forced—undoubtedly by sound reasoning—to change very suddenly from the saddle of reaction to that of impulse turbines.

The fact that the inspection of the Oerlikon turbine at the City of Milan Electricity Works was greatly instrumental in securing them the order of the London County Council can be read by anyone between the lines of the Press announcement of this business.

Generally speaking, Mr. Baldwin's letter does not touch the real essence of my letter; the remarks he makes are irrelevant.

Coming to Mr. Boot's letter (ELECTRICAL REVIEW, January 1st), I am really pleased to have contributed somewhat towards that gentleman's hilarity; it is worth knowing that you have succeeded in amusing somebody.

Do you think I should, or, in fact, could, answer the letter under "Concilio et Labore" (ELECTRICAL REVIEW, January 8th)? I think not! It is altogether a too complex literary effort. I wonder what import duty that gentleman had to pay for his capacity for work in the "Fatherland."

Mr. Percy W. Turner (ELECTRICAL REVIEW, January 15th) has hit off the matter to a nicety, and I could hardly improve much on his words. Sufficient to add and to beg

that Switzerland, the country of domicile of the Oerlikon Co., should not be thrown into the same basket with Germany. The former has to buy and import all raw materials from Great Britain and other countries, and to export the manufactured goods again.

Comparing the tariff of Switzerland against foreign countries, with that of other nations, it is very low, and I question what some of the British manufacturers, including "Mechanolectric" (ELECTRICAL REVIEW, January 22nd), would do if they had to turn out their goods under such very adverse circumstances.

G. Wuthrich.

London, W.C., *January 23rd*, 1909.

Tired Arc Lamps.

With reference to "C. W. B.'s" letter regarding tired arc lamps in your issue of 22nd inst., one reason (we do not say it is the only one) which will account for this is that when a lamp is first installed, it works with the carbons sent out by the lamp makers, who naturally supply a quality which experience has proved to be most satisfactory, and the brilliant effect noticed by "C. W. B." is the result.

Sooner or later, either the contractor or the user of the lamp finds it is possible to purchase cheaper carbons than those supplied with the lamp; the fact that there are different qualities in carbons, as in other articles, is overlooked, the cheap carbons are purchased, and the tired appearance commences.

The Crathorne & Green Manufacturing Co.,
F. J. GREEN, *Manager.*

London, S.E., *January 25th*, 1909.

Electrical Fatalities in Collieries.

I do not hold a brief for colliery owners or managers, but I think it is only fair that their side of the question should be put before your readers. It is all very well to talk glibly of inspections, but to anyone who is acquainted with the modern colliery, and the area it covers, inspection is by no means such a simple matter as it seems. For a really efficient system of inspection, such as could be relied upon to ensure that every part of every electrical apparatus about a colliery was always in such condition that no accident could take place with it, an army of inspectors would be necessary.

It is hardly realised that getting about a colliery, even to those who are brought up in it, is not a very easy matter when work is going on, and it is very much more difficult, and takes considerably longer time, to those, like the men who are usually employed as colliery electricians, not brought up in a colliery. Main roads in the large collieries extend for very long distances, and branch roads from them are also of considerable extent, and cables and other apparatus may be in any part of either main or branch roads.

Again, the cost of getting the coal in the United Kingdom is constantly on the increase. The coal seams, as your readers are aware, that are being worked are getting deeper and deeper below the surface. The distances over which the coal has to be hauled, and over which men have to travel underground, are getting longer and longer.

This is one reason why electricity is making such headway in collieries, because it is more economical to transmit power by it over the long distances ruling in collieries. In addition to this, the seams that are being worked are most of them very much thinner than those worked in days gone by. In many districts, the best and thickest seams have long been worked out, and those remaining are very thin and very expensive to work.

In several instances, the actual getting of the coal has only been rendered possible by the adoption of machinery—again, in many cases, worked by electricity. Further, the tendency of Trade Unionism has been to reduce the amount of work done by the individual collier, while his wages have been steadily increased.

The men ruling the Miners' Federation are exceedingly able, and perhaps one of the most important feats which they have accomplished, has been the upsetting of what was supposed to be an economic law. The teachers of political economy in the past said that wages were provided out of the fund which was left after other things had been paid. At the strike in 1893, the leaders of the Miners' Federation said that this should no longer be. They said the coalowners should go into the market, having to pay a certain minimum fixed charge for wages, just as they would for any other commodity, and asking for prices for their coal from buyers in proportion. The men won. A minimum wage was named, and not only have wages never been less than the minimum since then, but for the major portion of the time they have been considerably above it.

The tendency of this has naturally been to reduce the time the collier is inclined to work. Now we have the eight-hour day, with a certain reduction in time at once, and a further reduction in a few years.

All these things mean extra cost in working. Can it be wondered, then, that mine owners and boards of directors seek to economise in every way, and that colliery managers, under pressure from their directors, also look askance at every new outlay?

In addition to this, for various reasons, the electrician who comes to a colliery from outside is not always as efficient as he might be. I use the term efficiency, in this case, in the proper sense. His running costs are apt to be high, though his own wages may be low. In the first place, he is as much at sea in a colliery as the proverbial landsman on the topsail yard of an old sailing ship when reefing topsails. In fact, the two industries are very much alike in that respect. The sailor who has been at sea from boyhood is as much at home in places where a landsman would only venture with the greatest care as the landsman himself is on *terra firma*. Similarly, the man who has been brought up in a mine is as much at home in all sorts of situations that are exceedingly awkward to the non-miner, as the latter is on an ordinary country road.

And this in itself leads to considerable waste of time, and to great inefficiency. At sea, in the old sailing-ship days, the saying used to be, one hand for the Queen and one hand for yourself. In a great many cases it was the common practice with old salts to give both hands for the Queen.

The sailor who has not to think about his own safety can do a great many things, easily and well, that the man who has to think all the time, and does think all the time, if he may not slip off the yard, cannot possibly do. Similarly, the trained miner, who has not to be thinking all the time of his own safety, whose instinct tells him when he is safe, and when danger is about, can do a great many things, easily and well, that the outsider can hardly attempt.

Further, working at a colliery, as your correspondent, "An Ex-colliery Electrician," has mentioned (ELECTRICAL REVIEW, December 18th, 1908), is not very pleasant to those who are not accustomed to it. It is very dirty. It is very rough, and the conditions of working are necessarily often trying, at least to those not accustomed to them.

I think that, in the great majority of cases, the most suitable, and even the best educated men, from the practical point of view, have not always got into colliery billets. A youngster straight from a technical college, with no practical experience of electricity of any kind, is at a very great disadvantage in a colliery, quite apart from the other conditions named above.

Men who have very little knowledge of electricity, and who have gravitated into electrical work because it was fascinating, and because they thought it was easier than the work they were doing, are not likely to be of much use in a colliery. Even the very best men will be heavily handicapped by their want of familiarity with the surroundings, until they become accustomed to them.

What, then, will be the case of those who know very little of electricity, and, perhaps, have never before seen a coal-mine?

I suggest that there are two remedies for the undoubtedly serious condition of things, with regard to accidents from electric shock in coal-mines. I have very little faith in inspection, but I have a great deal of faith in the education of the colliers themselves, as a body, and in putting more money into insulation.

Almost everyone of the troubles that have arisen, have been caused by defective insulation. Either a cheap cable, cheap switch, &c., was put down in the first instance, or if the insulation has been good, it has not been properly protected, and the result has been that it has failed at some point quite out of sight, some apparently harmless conductor has been rendered alive, and some unfortunate man has gone to his death.

Knowledge of the elementary principles of electricity, if disseminated among the working colliers, would do a great deal to protect the workers themselves, by showing them what to look out for, and how to make sure that the insulation was good, before touching certain parts of an apparatus. Better insulation, and better protection for the cables at critical points, combined with the system of testing enjoined by the Home Office Rules, should do the rest.

Sydney F. Walker.

Bath, *December 30th*, 1908.

A correspondent asks for the name of the makers or suppliers of incandescent electric lamps with metallised filaments, not metallic filaments.

THE PETROL-ELECTRIC DRIVE.

IN our last issue we referred briefly to the discussion which took place during the week, at a meeting of the Society of Road Traction Engineers, on the advantages or otherwise of electrical transmission from the engine to the road wheel as compared with other systems.

As we mentioned in our note, Mr. W. A. Stevens introduced the matter, speaking on behalf of electrical transmission.

The subject is, of course, not new to Mr. Stevens, who with Mr. P. H. Frost-Smith (the chairman) devised the petrol-electric 'bus adopted by Messrs. Tilling, and described in our issue of January 17th, 1908. It was largely on the performance of these latter vehicles, substantiated by comparative running costs of the two types of 'bus owned by Messrs. Tilling, that the discussion turned.

With Mr. Stevens's opening remarks we need not deal, as they merely recapitulate the well-known advantages of electric transmission and control; he, however, pointed out that Messrs. Tilling's vehicle had run 35,000 miles in public service in 49 weeks, the electric motors having covered the last 28,000 miles without any repairs or even brush renewals—a record which speaks for itself.

As regards the comparative costs of working the two types of vehicle in Messrs. Tilling's service, these cover six months' running, and are as follows:—

WORKING COSTS: PENCE PER MILE.

	Petrol-electric.	Gear-driven, average.
Running	·875	1·607
Maintenance	·082	1 169
Tires	1·500	1·500
Drivers	1·245	1·245
Conductors	·897	·897
Petrol	1·220	1 089
Lubricants	·067	·286
Grease	·005	·066
Paraffin	·050	·050
Vehicle lighting	·134	·136
Body upkeep	·320	·324
Traffic expenses, insurance, rent, rates and taxes, water, gas, &c., supervision, depreciation, telephones, establishment charges, &c.	2·125	1 737
	8 520	10·106

Commenting on the above, Mr. Stevens said:—

These figures, which are official and can be confirmed, show a balance in favour of the petrol-electric vehicle of 1·586d. per mile, this on an average running of 35,000 miles per annum, representing a saving of £230 per annum on each vehicle. In a fleet of 500 vehicles the saving would be at least £115,000 per annum.

In comparing the figures for running costs and maintenance in the two systems, you will notice a difference in favour of the petrol-electric of 1·819d. per mile. This great saving is due to the replacing of the clutch, gear box and differential, with either internal rack, chain wheels and chains, or worm gear, as the case may be, as a final drive, by a dynamo, controller and two electric motors driving single reduction worm gears, and it is upon the durability of its transmission that the petrol-electric bases claim to existence. The dynamo, motors and controller have run for the last 28,000 miles without any repairs or renewal of brushes, and at the end of the year's run were in as good a condition as when new, and I am confident that a year's run of 35,000 miles can be made without brush renewals.

No appreciable wear has taken place on the commutators, which should last at least seven years before requiring renewal. After a run of 35,000 miles the single reduction worm drives show so little signs of wear, that the life of a set of worms and worm wheels can be set down at 100,000 miles, and the maintenance of this part of the transmission may be taken at no more than ·2d. per mile.

With several petrol-electrics in service together, it is obvious that the running costs and maintenance can be further reduced. A good armature winder and mate would be sufficient to maintain the electrical equipments of a fleet of 40 to 50 vehicles in good condition.

Taking the next item, petrol, in which a difference occurs, it will be seen that the gear-driven vehicle has scored during the past six months to the extent of ·131d. per mile. The cause of this has been found, and in the future, especially in new vehicles, the figures should be on a par, with a possible advantage to the petrol-electric.

The next items, lubricants and grease, however, reverse the position, showing an advantage to the petrol-electric of ·28d. per mile, giving to the petrol-electric a net advantage of petrol, lubricants and grease of ·15d. per mile.

Having no gear box, the petrol-electric has no use for gear box lubricant. It has the advantage also of having an engine which will run at least 300 miles to the gallon of lubricating oil.

The combined items, traffic expenses, insurance, rent, rates and taxes, water, gas, supervision, depreciation, telephones, establishment charges, &c., count against the petrol-electric to the amount of ·388d., owing to the cost of the chassis of the petrol-electric vehicle being 25 per cent. more than that of the gear driven, and also to its being subject to only a year's depreciation. As, however, the life of the petrol-electric must be at least 25 per cent. longer than that of the gear driven, this difference may be ignored, but sufficient difference between the running costs of the two systems, has, I think, already been shown to induce intending purchasers to seriously consider the claims of the petrol-electric system.

For the gear-driven vehicle, Mr. A. W. Windsor (of the Commercial Motor) took up the cudgels, on very brief notice. His remarks tended to show that electrical transmission did not obviate trouble with the engine, brakes, wheel bushes, &c. (which, however, are common to all engine-driven 'buses); that rapid acceleration was not necessarily required in a London 'bus, and in any case the steam-driven vehicles in use were quiet and gave rapid acceleration. This speaker and others argued that the weight and first cost were against the petrol-electric 'bus—the weight being—chassis 3 tons 3 cwt., total weight 4 tons 13 cwt., and the first cost of the complete 'bus some 15 or 20 per cent. in excess of the gear-driven vehicle.

It was also suggested that the up-keep would necessarily be higher owing to the greater weight, and that the figures given were not strictly comparable, owing to the greater age of Messrs. Tilling's gear-driven vehicles. On these points, however, it was shown that the petrol-electric vehicle, owing to the absence of gearing, is subjected to far gentler usage—indeed, Mr. Stevens considered that the life of the engine would be doubled—also that Messrs. Tilling's gear-driven vehicles had been improved and were in better condition than when bought in 1905.

Both Mr. Windsor and Mr. Worby Beaumont considered that the more recent gear-driven 'buses were costing nearer 8¾d. per mile (including depreciation), than the figure mentioned by Mr. Stevens; the chairman (whose connection with Messrs. Tilling is well known) disputed this.

Col. Crompton was strongly in favour of the electric transmission; in his opinion (and ours) mechanical gear for such frequent gear-changing—800 times a day is a recent estimate—was obsolete.

He considered that the battery 'bus was the best vehicle, *if* the battery could be maintained at the price stated; the steam and petrol-electric vehicles came next, and the gear-driven 'bus last of all.

On behalf of the petrol-electric vehicle, it appeared necessary to reassure some people as to the reliability of the electrical equipment, a matter which—considered in the light of the practical success of tramway and other outdoor electrical equipments at the present day—is somewhat surprising.

Not only reliability, but the possibility of effecting repairs required emphasising; Mr. Kerr Thomas pointed out that

the electric motor, from its nature, could not wear out so quickly as a gear drive, and that this actually led to a reduction in the number of the repair staff which would be required, so that the provision of an armature winder was not a serious matter.

Moreover, if an armature burnt out—which was not anticipated—it was easy to insert a spare armature, and took far less time than pulling down the mechanical parts of a gear for repair, &c.

The Chairman remarked that the higher depreciation figure for Messrs. Tilling's petrol-electric vehicle was due to its higher first cost and to the system adopted of spreading the cost of each vehicle over seven years; he considered, however, that the petrol-electric 'bus would easily last 10 years, from his experience of it.

Touching on repairs, &c., the average cost per mile of the night shift (for repairs, &c.) in the case of the gear-driven 'bus was 1d., owing to the numerous details which required attention. The petrol-electric vehicle required much less cleaning, as only the engine and brake-gear required attention in the garage; the electrical equipment was always kept locked up, and was examined during the day when in service.

A point which the chairman emphasised was the practical absence of police interference with the petrol-electric vehicle.

From the foregoing it will be gathered that the discussion was a strong testimony to the petrol-electric drive, although it is a matter for regret that Mr. George Pollard (London Road Car Co.), who was to have championed the gear drive, was unavoidably absent, this no doubt accounting for the scarcity of facts and figures as to the gear-driven vehicle. While, doubtless, the running cost of the latter is a rapidly-improving figure, one can scarcely doubt that this desirable feature will be common to both types of vehicle. It is useless to pretend that any change-speed gear which involves the meshing of moving spur-wheels many hundreds of times a day, can be anything but a dismal failure and source of weakness, however much a vehicle so equipped may be improved in other directions.

PROCEEDINGS OF INSTITUTIONS.

Heat Losses in Electric Power Stations.

LOSSES in steam generating and using plant begin literally at the beginning with the very turn of the stoker's shovel, and they go on to the bitter end, affected by such apparently paltry details as the joints of the exhaust pipes, or a few pinholes in some buried water pipe.

There are big losses and small losses, but all are quite worth the attention given them in the paper by Mr. F. H. Corson, read before the INSTITUTION OF CIVIL ENGINEERS on the 22nd ult. This author has studied the heat losses at the Blackburn electrical works, with a view to finding what losses do occur. First, he sent out an inquiry to 34 principal stations, and found that electricity generation cost from 0·13d. to 0·83d. per unit for fuel, requiring from 3·6 to 15 lb. of coal, the average being 7·7 lb. This was in 1903. The pious opinion is expressed that matters have improved since then.

About 8 lb. of water are evaporated per lb. of coal, and 1 KW.-hour represents 28 lb. of steam, or 3·5 lb. of coal. These latter figures refer only to the main generators, therefore one-half the fuel is to be debited to the auxiliary processes.

At the time referred to, coal per unit at Blackburn amounted to 10 lb. at a cost of 0·38d.—a most unsatisfactory performance, indicating that about 60 per cent. of the heat value of the fuel was absorbed by subordinate uses and by losses of various kinds. Water evaporation was from 40 lb. at full load to 150 lb. on night load, per unit.

Tests were instituted with a view to elucidating the losses, and as a result, boiler settings were overhauled, walls made impervious to air, and better-fitting dampers provided, while firing was more carefully controlled.

It is satisfactory to know that a saving was effected, for these subjects have been treated of by steam engineers for the last quarter of a century, and it is only lately that they have been at all generally admitted to be anything but fiddling.

How often, for example, have steam engineers condemned the steam ring system and the ridiculous multiplicity of valves to shut off every possible combination of boilers from every possible engine. How much better it is to have steam pipes of the best, so as to abolish the fear of breakdown which has led to the steam ring. Mr. Corson points out that, by dropping the steam ring, no less than 140 ft. of 10-in. main was relieved of the costly duty of condensing steam; better-arranged drainage admitted of the removal of unnecessary separators; thus was radiating surface reduced to a minimum. In 12 months the fuel consumption had dropped to 8·5 lb., or about 15 per cent., and the continuation of effort brought it down to 6 lb.—a saving of 40 per cent., it is true, but still undesirably high. The causes are summed up as: failure to secure the best fuel, or to obtain the calorific value prescribed; improper air supply; loss of fuel in the ash; loss in the furnace gases; heat loss by leakage, radiation and condensation; loss of heat at the main engines, and loss of heat at the auxiliaries. Tests to evaluate each loss were carried out over a period of two years, and finally a week's test of the entire plant on broad lines, as accurately as was possible with fuel weighed in over the weighbridge. There are two stations each of about 2,300-KW. capacity adjoining each other. In the older station are nine high-speed sets of 120 to 550 KW. D.C., three high-speed alternator sets of 60 to 200 KW. for outlying district lighting, and a motor-alternator to link up the A.C. and D.C. systems. There is a central condenser plant of 20,000 lb. capacity per hour, six Lancashire boilers at 130 lb., Weir pumps and 480 economiser pipes. The steam pipes are covered 2 to 3 in. thick.

In the new station are three 775-KW. high-speed sets and six 185-lb. Lancashire boilers with superheaters, 1,024 economiser pipes, Hall pumps, and, though this is not stated, presumably covered steam pipes with a surface of 0·355 sq. ft. per KW. capacity; this area at the older station being 0·39 sq. ft.

The coal was valued at the mean of the past 12 months, sampled tests being taken daily. Flue gases were analysed continuously, water was metered, temperatures were taken at condenser points, and the auxiliary steam consumption was found by direct trial.

Calorimeter tests of coal have not shown that the best coal in heat units is always best commercially, so much depending on clinker, smoke formation, and so on. These factors should, of course, always be judged in connection with the value of a fuel. A fuel will change its value for any given station according as the stoking is by hand or by machine.

Thus of six tested coals, the best but one, No. 5, as regards heat units for a penny, could not be used at all, so very smoky was it that its trial was left unfinished. The best, No. 6, had very adherent clinker. No. 3, with the highest value in B.TH.U. per unit weight, was lowest in B.TH.U. per penny, and worked badly.

No. 1, the worst but one in heat units per pound and third in heat units per penny, was commercially and all round best. It cost 1d. per 364,670 B.TH.U. These facts do not fix this coal as best for other places, for even the smoky No. 5 might have been best in a really good furnace which would not smoke. Still, the results taken as they are show that the mere calorific value of the coal is not the only quality to be taken into account in purchasing a fuel. And there is no doubt justification for colliery men to sell coal as coal and not as heat units. A locality soon learns its coals, and prices are fixed for each class by its all-round qualities.

In testing coals for moisture, they were spread on a plate for 24 hours in air at 110° F., and after this they would still lose 1 per cent. if dried for an hour at 220° F. But nothing is said as to whether this heating drove off water or gases. Generally it is concluded that coals lost 6 per cent. by drying. A Thompson calorimeter showed 13,180 B.TH.U. per pound of dry coal, or 12,310 per pound of coal as fired. This is the mean of 73 tests.

The Krell CO_2 recorder was used as a continuous CO_2 recorder checked by an Orsat apparatus periodically. The author feels certain from various results that the gases in the flues are stratified and not mixed as between the output of the several boilers. The gases also appeared to be separated by centrifugal action in passing round a curved flue, the outside of the curve being richer in CO_2—the heaviest gas by about 2 per cent.

As regards the specific heat of the flue gases, we can hardly think the author need feel much doubt in computing the mean specific heat from the known composition. Specific heat is a molecular property of a gas, and surely will not be possibly changed as suggested by the presence of dust. There appears to have been no foolish attempt to find the dryness factor of the steam before superheating.

After superheating, obviously the instrument to show the degree of dryness is the thermometer. Without superheat there is no known method for even taking a sample of steam that shall represent facts.

The water meter was tested by tank measurement. It was placed in the suction pipe on which was an air vessel, and this allowed water to flow back through the meter, but did not reverse the meter. This was detected and the fault stopped by a non-return valve. Generally all precautions appear to have been taken.

The tests showed that the pipe loss was 473 B.TH.U. per sq. ft. per hour. The total was 881,000 B.TH.U. The test was made at 380° saturation temperature and does not represent the truth, for the steam flowing in the pipes was at 450° and 650°. It was found that with a flow of 16,000 lb. per hour at 580° to 600°, the temperature fell 15° in a 72-ft. length of 14-in. pipe. The same weight through a 10-in. pipe lost less in temperature. The author thinks it should have lost more owing to the greater frictional effect, but we should not anticipate that this would outweigh the difference of surface. However, the author speaks up for smaller pipes if the figures can be substantiated.

Thus, while saturated steam lost 473 B.TH.U. as above, superheated steam lost only 376 units on a basis of specific heat = 0·48, and only 427 units on a basis of specific heat = 0·545. Both the latter figures are below the saturation loss as we should expect them to be in spite of the higher temperature, but all such figures are doubtful. Still men who advocate superheat always affirm that superheating does reduce pipe losses.

It was found that steam jets under the grate bars consumed 2 per

cent. of the evaporation of the boiler. Quite so. Is not this a good reason for fighting shy of such jets if possible? This figure was obtained by taking all the jets from one boiler and observing the evaporation for this one expenditure only from that particular boiler. These jets alone cost £85 annually. The steam pipe condensation represents £250 per annum.

Could not the author reduce the leakage of the boiler blow-off cocks by using two cocks in series, one to be opened up first and closed last so as to throw all the grinding effect of the sludge on the other cock? We do not find the necessary figures to enable a judgment to be formed on the shortening of the grates by 9 in. but it is a matter that may often be attended to with advantage to economy. As the author says, it is difficult—very difficult—to see how to save the steam pipe loss. We are convinced, however, that much may be done by keeping pipes small even at some loss of pressure, for economy is usually a matter of the best compromise of conflicting factors. If steam pipes are ever to be in duplicate it were better to have two pipes—large and small—for full and for small power working. This would save steam during many hours of the day when steam was on the small pipe for the light loads.

The author makes light of the pump wastes because the steam goes to the feed water. Some would add to this "to reduce the economiser performance."

It is interesting to note how the water losses by condensation disappear between 3 p.m. and 9 p.m., between which hours the steam pipe heat losses are not equal to the units of superheat in the steam flowing. During the rest of the day there is always water to be drawn from the pipes, showing that the superheat in the small flow of steam is too little to afford the loss due to radiation—another argument for smaller pipes for the period of light load and against the folly of ring or duplicate mains unless of smaller size. To revert a moment to coal testing, if any reliance at all is to be placed on calorimeter tests, coal lots should be well sampled by taking large bulk samples of several shovelsful from a number of points in a boat or car load. These should be mixed and put through a crusher to reduce them to not above walnut size, carefully mixed and laid out within a circular or square curb, quartered by a cross frame, and opposite quarters rejected; again, mixed and quartered and crushed smaller as the bulk becomes less. The final quartering is ground in a coffee mill, and a sample for the calorimeter is taken from this, and should be fairly representative, though it cannot be taken as a guide to the behaviour of the coal in the furnace. This is a matter of observation of daily results. The general efficiency shown by the tests is 5·35 per cent. on the basis of the total heat in the coal. This is a very poor showing, of course, and seems to indicate room for much improvement.

The steam engine, with its huge pipes for full-load working, and its own wastes at low loads, is very uneconomical. The station engineer generally might well consider later forms of heat engines. Gas has no pipe losses that cannot be wholly checked by good work. The light load losses of a gas engine on "poor" gas, which might now not inaptly assume the name and English pronunciation, power gas, are probably no more costly than those of the steam engine, taken all round. The paper is useful, in that it shows the wastefulness of improper design or unfortunate site. Thus in the case of the large sets there is no admixture of the steam from the different superheaters; yet these are of a type to give very wide temperature range only to be corrected by averaging. To be noted, also, is the bad disposition of all flues and economisers, and the extravagant length of steam pipes. These faults are, if due to the site, a warning against such sites. But is it not often the case that bad sites are selected with no thought to the heavy annual charge they bring on an undertaking? Especially in cases of long daily working are steam pipes important, for condensation, nearly to the full, goes on at all hours irrespective of how small the load, and this is particularly a fault of lighting stations with long hours at light load, unless the steam pipes are arranged very differently from what they are in the station of this test. But it is easy to see where losses occur, and often very difficult to bring about economies without costly and drastic alterations. The author of this paper shows how he has set about the problem and what he has succeeded in doing, and has produced a paper worth studying.

The "G.B." System of Traction.

By STANLEY CLEGG, M.I.E.E.

(*Abstract of a paper read before the* INSTITUTION OF ELECTRICAL ENGINEERS *in London, January 14th*, 1909.)

THE overhead trolley system being objected to in Lincoln, the author inspected the Lorain surface-contact system at Wolverhampton, and the experimental track of the "G.B." Surface Contact Co., at Ilford, and recommended his Tramways Committee to adopt the latter on the grounds of capital cost, and the absence of projecting studs, if the interests of the Corporation could be properly safeguarded.

An agreement was signed which provided that the working of the "G.B." system, as installed at Lincoln, should be in every way efficient and satisfactory, during the 12 months covered by the agreement; that the collectors on the cars should be of such type as to allow the cars to be run up to a rate of 16 miles an hour without undue sparking, the steadiness of the car lighting to be the criterion; that the electrical energy necessary for exciting the magnets of the "G.B." collecting apparatus on the cars should not exceed 480 watt-hours per hour per car, and that the total consumption per car-mile should not exceed 1·3375 units measured at the electricity works; that not more than 18 studs in any year, for a period of 10 years, should become charged with electricity when not in use for supplying energy to a passing car, and should remain undetected by the car that caused them to become so charged; that the cost of maintenance of the special apparatus peculiar to the "G.B." system, in efficient working order and repair, should not exceed an average of £30 per mile of track per annum, during a period of 10 years.

The system was installed, and the whole of the work completed ready for running, between July 1st and the middle of November, 1905, and after inspection by the Board of Trade, it was opened for service on November 23rd.

The Board of Trade granted a permit to run for 12 months on December 1st, 1905, and has since offered no comment of any sort. The system generally conformed satisfactorily to the requirements specified above, except at cross-overs and junctions, where it was found necessary to insert resistance in circuit with the studs to prevent short circuits with the rails by way of the collector chains. The resistance studs have acted very efficiently; the resistances gave trouble at first owing to their not being waterproof, but this defect was remedied by the "G.B." Co. It was found that 210 watts sufficed to excite the magnets, instead of the 480 watts allowed.

During the first year the cars ran a total of 135,144 car-miles, the total electricity taken, exclusive of shed lighting, but inclusive of car lighting, being 164,739 units, giving an average of 1·219 units per car-mile run, or a saving of 0·1185 unit per car-mile on the figures guaranteed by the company. (The figure 1·337, included in the conditions as the maximum, was agreed to be a liberal figure.) During the last 18 months the consumption per car-mile has been reduced to 1·108 units, due, in the author's opinion, to improvement on the part of the drivers. The leakage has not averaged more than 0·25 ampere for the 3 miles of track. The Committee at first distrusted the springs upon which the action of the studs depends, but during the whole period there has never been a live stud which has come under the guarantee clause—that is, which has remained undetected after a car has passed.

There is another kind of temporarily live stud—one which has apparently given considerable trouble on the Bow Road tramway of the London County Council—which remains alive long enough to be notified by the detector brushes, but which, by the time the car has been reversed and the detector brush again brought over it, has gone dead. This defect may be due to a weak spring; stud set too near live cable; sticky switch-piece; arcing between the carbon and the cable; or leakage over the surface of the road, owing to the presence of some exceedingly good conducting medium.

The only time that the author was at all troubled with studs coming under the last heading was when salt was used for the purpose of melting snow on the track.

During the first 12 months there was a total of 71 live studs, of which two causes were responsible for 49—viz., broken flexes 25 studs, and carbons burnt away on one side 24. Early in the year a number of live studs were notified, which, when taken up, were found to have the flexibles broken and either the spring burnt through or sufficiently elongated, due to heat generated by the passage of the current, to allow the carbon to be in contact with the cable.

At first it was difficult to say what was the reason for the flexibles breaking. Later, however, it was found that the small copper wires of which the flexibles were composed were being gradually converted into copper carbonate and hydrate. The "G.B." Co. investigated the matter, and found that this action was produced by coal gas percolating into the conduit and acting upon the copper flexibles.

Before the studs were put in, the flexibles had been coated with vaseline, but as this was evidently proving an insufficient safeguard, the "G.B." Co. coated them with a fresh compound, which they could guarantee to be proof against the action of gas. There has not been a live stud due to the same cause since November 8th, 1906.

A Roots blower was installed at the car-shed, and it is the practice to ventilate the conduits for at least half an hour a day before the cars go out, ventilating outlets being placed at three points on the line. A small initial pressure, say not more than 6 in. of water, should be quite sufficient to cause a current of air through the Lincoln length of line, of 1¾ miles route, with 3 miles of conduit.

During the laying, certain of the tee-pieces were not set absolutely vertical, or before the surrounding cement had had time to set they were pushed over by being trodden on or knocked. The shape of the carbon which was first installed made no provision for such an eventuality, but on the fault revealing itself a new shape of carbon was brought out which was later installed throughout the line.

Studs of this type grew increasingly numerous; however, when the greater number of the studs had been re-carboned, trouble from this cause entirely ceased, and there has been no recrudescence.

Of seven studs listed under the head of broken or faulty springs, the failure of six was due to the same reason, viz., that when the workmen were forming the hook of the springs, in some cases pliers with sharp edges were used and the wire was slightly nicked, and the subsequent working of the stud eventually caused this weakened part of the spring to give way.

Amongst the various classes of live studs there are no instances of studs becoming alive due to carbonising, as it is called, or leakage from the live cable to the stud. There has not been a

single case of this, the most frequent cause of trouble on surface-contact systems.

There is only one further class of live stud which calls for mention, and that is, those alive under the head of cable strands parted. The type of cable originally installed on the Lincoln tramways consisted of a galvanised iron stranded cable with a thick rope core, the total diameter being 1¼ in., having a conductivity equal to about 00 B.W.G. trolley wire. There were two layers of wires, of which the gauge of the lower was 15 B.W.G. and of the upper, or surface layer, 8 B.W.G.

Service conditions of a few months revealed the fact that this type of cable was entirely unsuited to its duty, as six months' wear in some cases cut deep grooves into the upper strands, with the consequence that the cables had to be moved about every three months in order to give new places for the carbons to make contact, and after 15 months' use, in some places the strands were so far burnt through that they snapped when moving.

The total expenditure during the first 12 months under the heading of electrical equipment was £26, of which £16 was incurred in such items as replacing faulty studs, pumping out conduit drain sumps, attending to access boxes, &c., and the remaining £10 in periodically moving the "G.B." cables.

It will thus be seen that, as far as actual expenditure went, the system had so far come amply within the limits imposed. However, the author realised that the life of the "G.B." galvanised iron cable, and also of the carbons, was half run, and that, therefore, taking these facts into consideration, the real expenses would be very largely in excess of the £30 per mile of single track guaranteed.

The company accepted the recommendation which the author made to his Committee—viz., that the "G.B." system as applied to the tramways should not be taken over except on condition that: (*a*) A new type of cable be supplied and laid, free from the defects which had shown themselves in the original one. (*b*) That they supply and fix new carbon contacts of such shape and thickness as to overcome the difficulty experienced with non-vertical tee-pieces, and also to give a longer life.

The body of the new cable consisted of a galvanised iron stranded wire 44/·104 in., wound on to a rope core; the overall diameter was reduced, however, by ¼ in. to allow for the original diameter being made up by afterwards threading on solid-drawn galvanised steel tube in lengths of 6 in., which preserved to the cable the necessary amount of flexibility. A number of strands of tinned copper wire, according to the conductivity required, were laid under the galvanised iron wires.

With the Lincoln service, say, averaging 7 minutes, it would not be necessary to move the cables more than once every 12 to 15 months; and, as on each length 4 ft. 6 in. is allowed as clear space, moving 3 in. at a time would give the sleeves a life of 14 years. This could easily be doubled to make up for the extra wear of a 2 or 3 minutes' service, as it should be perfectly easy to give the cable a half-turn, and to get at least two bearing-places on the same circumference.

The stud heads which were installed at the beginning, and which are still in use, are plain cast-iron; though they stood the traffic very well, they are now slightly hollowed out in the middle, and it has recently been necessary to go through the track packing them up. This operation should make them last for at least another eighteen months or two years, making their total life five years.

Despite the fact that over a portion of the line there is a large amount of steam lorry and other heavy traffic, the number of stud heads which have been broken has not amounted during the three years to more than three dozen, and if steel heads were used wherever there was most traffic their breaking would be entirely avoided.

Every car carries a tripod and lamp, which, in the event of a stud being notified, is placed over it in the road until such time as the lineman arrives; no inconvenience whatever is caused to the service, especially seeing that during this last few months, since which time the new cable has been installed throughout the track, live studs have not averaged more than about one a month.

It has been found necessary, on account of the amount of scrap iron found along the route on which the tramway runs, to carefully cover, as far as possible, the iron parts of the collector. The most satisfactory way of doing this has been to case them in wood, the space between which and the metal is afterwards run in with pitch.

The type of collector chain which we are using has given great satisfaction, as over 20,000 car-miles are obtained from the cast-iron links which form the units of the chain, and from 8,000 to 10,000 miles as an average life of the galvanised iron-wire rope on which they are threaded.

In those towns where there is objection, for æsthetic reasons, to the overhead wires, it does not seem that 10 per cent. on the cost—the amount by which the "G.B." system exceeds the cost of the overhead—is a large amount to pay. The Lincoln tramways compare very favourably in their maintenance costs with those on the overhead system. For the year ending March 31st, 1901, the total working costs were 6·10d. per car-mile, made up as follows:—

Traffic expenses	2·28d.
Repairs and maintenance	1·25d.
Management and general expenses ...	1·18d.
Power expenses	1·39d.
	6·10d.

The average total working costs of some 70 other municipalities, mostly 1907 figures, were 6·31d. per car-mile run, showing an advantage for Lincoln of 0·21d., which, considering the fact that only 145,235 car-miles were run—the fewest of any municipal system—proves to the author that better results might be looked for with a a larger system.

During the whole time the tramways have been running the current has never been off any part of the line owing to failure of the electrical equipment (apart from the feeders), a claim which the author considers few overhead systems can make. The fact that the live cable is enclosed in a ventilated conduit, and is thus free from the effects of the weather and the vibration caused by the passing trolley boom, renders it much less liable to breakdown.

Apart from the great snowstorm in January, 1907, a total of only 100 car-miles (or 0·0354 per cent. of the total car-miles run) have been lost in the three years; of this total, 75 per cent. was due to faults on the cars, and 25 per cent. to the melting out of the main feeder from its socket in the section pillar.

The author considers that, with the working of the "G.B." surface-contact system, there is less danger to the public, from shock and personal injury, than there would be with the overhead system, as studs which have become alive at Lincoln have always been located as soon as they have occurred, without danger to anyone.

The silent running of the cars at Lincoln is a point which is remarked on by everyone, particularly by visitors to the city who, living on overhead tramway routes, have been accustomed to receive warning of the approach of the cars by the noisy hum of the trolley.

DISCUSSION.

THE discussion which followed the reading of the above paper should, if it obtains due publicity, do much to reassure the very considerable section of the community whose harassed feelings may be primarily ascribed to their daily newspapers.

Both PROF. SILVANUS THOMPSON and MR. A. TROTTER (Board of Trade) said sufficient to convince the majority of engineers that the G.B. system must be taken seriously; Prof. Thompson, as an old hand at surface-contact tramways, was in a position to realise the many difficulties which beset such a system in practice, and his warm appreciation of the simplicity and excellence of the "G.B." design and its good practical features will carry due weight; Mr. Alex. Trotter's remarks, based on an official connection with the line extending over some three years covered even more than constructive features, as he bore testimony to its efficient working in practice—a matter which is much to the point at the present time.

Both the Professor and Mr. Trotter had been mystified by the magnetic peculiarities of the stud system, but the former removed any doubt which might have existed, by his lucid explanation.

MR. H. M. SAYERS, while admitting the satisfactory working results at Lincoln, considered that the conditions in that city were not necessarily comparable with those in other places. He thought there was a danger of gas accumulating in the cable conduit and of explosion resulting therefrom; also that there was a possibility of corrosive action between the copper and iron strands of the cable, and that oxidation might also occur between the steel sleeves and cable, and prevent their being moved when required to provide fresh contact surface. As regards the accumulation of gas, this would depend on the permeability of the road surface; but, in any case, the gas must be cleared by means of blowers, and this, with a large system, might be difficult. He imagined that the cable renewals would be frequent, and that the scrap value obtained would not be so good as in case of trolley wire.

MR. B. E. BEDELL (of the "G.B." Co.), replying to some of the above points, showed that the conduit was a closed bitumen-jointed pipe embedded in concrete—not an open conduit; further, the possibility of corrosive action inside the cable was remote, owing to copper strands being tinned. Experience with the sleeves showed that after lengthy periods of rest the mere bending of the cable when withdrawing it for any purpose caused the sleeves to work along the cable. The author of the paper also supported the speaker on this point, and further, regarding the permeability of the Lincoln streets as effecting the leakage of gas, mentioned that the whole of the tramway route was a tar-macadam road, which is particularly impervious—a fact which was shown recently when, owing to a water pipe bursting, both gas and water made their way into the cable conduit without disturbing the road surface, and what is of more importance from the tramway men's point of view, without interfering with the running of the cars.

Mr. Trotter mentioned the difficulty of conducting an official inspection of a surface-contact tramway, where practically everything was hidden from view; this, he thought, justified the issuing of provisional permissions to run in such cases. He further remarked on the comparatively sluggish action of the Lorain stud, which at high car-speeds would usually remain alive long enough to give an indication on the car, although it subsequently became dead in the normal way.

Prof. Thompson compared the comparatively inexpensive "G. B." system with the enormously costly conduit; he considered that some such system as the former had a future in certain cities, such as Edinburgh, Oxford, Cambridge, &c., where the overhead trolley was inadmissible. The author, in his reply, remarked that the comparison was, in these days, more likely to be made with the trolley system, as in many of the smaller cities the expensive conduit was out of the question, but its nearest equivalent, the system adopted at Lincoln, was only 10 per cent. more costly than the trolley, and therefore quite within the range of such places. On the question of live studs, as mentioned in the paper, the cars had detected all of these since the tramways started working, but during the first experimental runs, one stud had remained undetected until a pony found it out; the pony was still at work As a matter of fact, the trouble in Lincoln was that the street traffic would use the tramway tracks, possible live studs notwithstanding.

The discussion, in the case of those speakers who had some practical acquaintance with the system, was in every way favourable to its future prospects as a practicable method of operating tramways; the Lincoln results, in particular, showed a marked improvement since the system commenced working and experience had been gained on a practical scale.

Institution of Electrical Engineers (Dublin Section).

AT the meeting on January 14th, MR. TATLOW showed a small reflecting dynamometer with bifilar suspension, and described a method of using such an instrument for the measurement of alternating currents and pressures, the chief feature of which consists in the manipulation of a regulating resistance in the circuit of the dynamometer so as to bring it in each case to one standard deflection.

For the measurement of alternating current the dynamometer is connected to the potential terminals of a non-inductive strip traversed by the current to be measured, and the instrument is brought to the standard deflection by changing the resistance in its circuit. The pressure fall on the strip can easily be found from the impedance of the dynamometer circuit, and the current through the instrument corresponding to the standard deflection. From this pressure fall and the resistance of the strip the current through the latter is found. The inductance of the dynamometer being small, the impedance can in all cases be closely expressed by $r + \frac{s^2}{2r}$, where r is the total resistance of the dynamometer circuit and s the reactance of this instrument.

The author showed that this reactance could easily be determined by passing a steady alternating current through two non-inductive strips of different resistances connected in series, joining the dynamometer to the terminals of each in turn and bringing the instrument to the standard deflection in each case, the reactance being calculated from the resistances used.

It was also pointed out that the instrument might be equally well used, in the same manner, as an A.C. voltmeter by placing suitable adjustable resistances in series with it.

The value of the current at standard deflection could be determined either by means of a known alternating pressure, or by means of direct current. The standard current for the instrument shown was about 8 milliamperes.

MR. TOMLINSON expressed the thanks of the meeting to Mr. Tatlow for bringing before its notice such a useful little instrument; he considered it of the greatest value on account of its cheapness. Hitherto the measurement of alternating currents and pressures in the laboratory had involved very expensive as well as very delicate instruments, but Mr. Tatlow had made for his own personal use in the first instance an instrument which retained the essential sensitiveness, but cost very little to construct.

MR. HOSGOOD read a short paper on "Shop Window Lighting," which was well received. He took his stand against the inartistic methods mostly to be seen, and the general opinion of the meeting seemed to be that very few shops in Dublin were properly lighted, although several supporters of glare were found, their argument being that the public were very like moths, and were fascinated by mere brilliance. One speaker suggested that the proprietors of certain shops which were positively painful to pass, because of the intense window lighting, knew their business better than the illuminating engineer, the idea being that customers would be attracted to the spot by the light and then blinded, so that no defects in the goods could be seen. Mr. Hosgood thought that the attracting business ought to be done by means of illuminated signs, and that the shopkeeper should use his windows for their primary object of displaying goods to the best advantage. He condemned as barbarous the use of low hung flame arc lamps with globes unobscured on the street side, and thought that the conditions seldom arose for placing the source of light outside the window. He favoured particularly the Linolite type of reflected light, and light thrown down from above by means of silvered glass reflectors shaped like deep truncated pyramids, the lamps in the latter case being invisible to the incurious observer. Mr. Hosgood was inclined to blame the contractors for not educating the shop-keepers to a higher standard of æstheticism, but it was pointed out by several contractors who were present that shop-keepers as a rule refused to be taught at their own expense, and would have brilliant naked lamps slung around the windows by flex issuing from a few ceiling roses, rather than pay for a scheme of lighting which would be much more likely to attract customers. It was mentioned, also, that every trade had its own particular form of window dressing, so that no cut-and-dried rules for illumination could find general application.

Nevertheless, the golden rule for every shop-keeper, no matter what his trade may be, should be—display your goods, not your lights; or use your light to show your goods, not your window to show your lights.

Stealing Electricity.—At Morpeth on the 21st inst. three married women belonging to Hirst, were each fined £3 and costs on charges of having robbed the Northern Counties Electric Supply Co. Defendants have penny-in-the-slot electricity meters in their houses, and the evidence showed that by means of the insertion of a piece of wire the electricity had in each case been diverted from passing through the meter, and therefore registration was avoided.

LEGAL.

PARRISH AND OTHERS *v.* MEXICO ELECTRIC TRAMWAYS, LTD., ∞ ∞ ∞ ∞ AND OTHERS.

IN the second Court of Appeal on Saturday, the Master of the Rolls and Lord Justice Buckley had before them two appeals in the above action, from a decision of Mr. Justice Eve, as to the plaintiffs' right to inspect certain documents. Some his Lordship had held to be privileged, and some not, hence both parties appealed.

Mr. R. Ogden Lawrence, K.C., and Mr. Bruce, appeared for the plaintiffs in support of the first appeal; and Mr. Rufus Isaacs, K.C., Mr. Stewart Smith, K.C., and Mr. H. Wright for the defendants.

MR. LAWRENCE said that the first appeal was against the refusal of Mr. Justice Eve to order the production of certain documents which were disclosed in the affidavit of documents of the second defendants, a Canadian company, and a Mr. Hubbard, and in respect of which privilege was claimed. The documents, which the plaintiffs asked to have produced, were such that a claim for privilege would ordinarily prevail, but the question arose whether this did not come within the principle laid down in 1895—whether there being a charge of fraud, the privilege was not taken away. The case for the plaintiff, as disclosed by his statement of claim, was that he was a shareholder in the English company, the first-named defendants, and was suing on behalf of himself and all other shareholders of the company, first the company, secondly the directors, and thirdly, the last-named defendants, the Canadian company, who held the majority of shares in the English company. The basis of his claim was that the Canadian company, holding the majority of the shares, and consequently the voting power, had put in their own nominee, and had obtained from the English company a lease of the whole of its assets at a consideration wholly inadequate. It was a device commonly adopted in America, and was known as a "freezing-out scheme"—freezing out the minority. The plaintiff sought to upset that lease on the ground that it was a fraud of the majority on the minority. The question turned upon the pleadings, and Mr. Justice Eve, though not without some doubt, had come to the conclusion that the plaintiff had not pleaded fraud, and that therefore the privilege remained.

LORD JUSTICE BUCKLEY pointed out that, if the lease was fictitious and in law inadequate, it affected the position of the whole of the shareholders in the English company, some of whom were really defendants to this action.

MR. LAWRENCE said his case was that the majority had leased the assets to themselves at an insufficient sum. They were, in fact, taking the whole of the company's property at an insufficient sum.

LORD JUSTICE BUCKLEY: But you want an allegation that they are doing it dishonestly. If they were doing it honestly, there was no fraud.

MR. LAWRENCE submitted that it was sufficient that he had pleaded that it was done for the purpose of depriving the plaintiff. He could put in the words "fraudulent or wrongfully," but he contended that it was not necessary when he had said that they had done it for the purpose of depriving him.

His LORDSHIP pointed out that the word "fraud" did not appear in the pleadings.

MR. LAWRENCE submitted that the pleadings as they stood were a charge of fraud and that was sufficient.

THE MASTER OF THE ROLLS, in giving judgment, said that upon the first appeal he thought the learned Judge in the court below was right. In order to do away with the privilege there must be some definite charge of fraud. They had not had their attention called to any paragraph in the pleadings in which the word fraud appeared, so fraud was not alleged in terms. When fraud was alleged it was very desirable that the exact words should be used. The alleged action of the majority was not to deprive the minority of all interest in the property, but to give the majority a lease of the property, and there was a rateable proportion of the rents reserved if the lease was granted by the English company to the Canadian company. The appeal must, therefore, be dismissed.

LORD JUSTICE BUCKLEY agreed, and the appeal was accordingly dismissed with costs.

MR. RUFUS ISAACS then proceeded to open the second appeal, which, he said, raised the same question, only in a different form. Mr. Justice Eve had made an order giving the plaintiff inspection of certain documents in the possession of the English company, which were of a similar nature to those in the first case, viz., communications between the company and its legal advisers in Canada with reference to the lease in question in the action. The ground upon which this was ordered to be produced, was that because the plaintiff was suing on behalf of himself and all other shareholders in the English company, he was, in effect, the company, and was entitled to see his own documents.

The further hearing of this appeal was adjourned until Tuesday.

RICHMOND ELECTRIC LIGHT AND POWER SUPPLY CO. *v.* JESSLETON.

AT Brentford County Court on Friday, before his Honour Judge Howland Roberts, plaintiffs sued James Mitchell Jessleton, of 113, Coldershaw Road, Ealing, for £3 10s. 3d. due under an agreement.

MR. C. ROBINSON, for the plaintiffs, explained that it was the practice of the company to supply fittings and installations under agreements by which the consumer paid for them on the hire-purchase system. A tradesman named Bockett entered into such an agreement. He sold his business to the defendant, who in turn entered into the agreement with the plaintiffs. Subsequently the defendant succeeded in getting his contract with Bockett set aside, but he forgot to deal in the same way with the plaintiffs. They could recognise Bockett now, having given him a release, and they were forced to look to defendant for the payments which fell due under the agreement.

The defendant set up the plea that the contract with the plaintiffs was part and parcel of, and consequent upon, his contract with Bockett. When this was set aside the agreement with plaintiffs naturally followed.

His HONOUR told him he had no defence to the claim, and found for plaintiffs with costs.

IN *re* THE ELECTRICAL MANUFACTURERS, LTD.—DAVIS *v.* THE COMPANY.

THIS action came before Mr. Justice Parker in the Chancery Division, on Saturday, on a motion for judgment, the company appearing and consenting to a foreclosure order.

It was stated that the plaintiff held all the debentures, and no others had been issued by the company.

His LORDSHIP thought that an affidavit should be filed stating that the plaintiff was the holder of all the debentures, as it was a representative action, and he was originally not the sole owner. Subject to that being done, the usual preclosure decree would be made.

Re THE IMPROVED ELECTRIC SUPPLIES, LTD.

AN action of considerable interest to traders in the electrical world, and involving charges of fraudulent misrepresentation, opened before the Official Referee, Mr. Verey, in the High Courts, on Tuesday, January 26th.

MR. R. F. COLAM, in opening the case, said he appeared for the defendants, a Mr. Joseph Grace Smith Cunnington and a Mr. Harry Pigott Alison, electrical engineers, and it was only a counter-claim which the learned Referee had to try. The original action was brought by the plaintiffs, Messrs. Henry Muff and Harold John Snowden, to recover a sum of £2,412, an instalment due under a deed of purchase of a business known as the Improved Electric Supplies, Ltd., of Great Newport Street, London, W.C., but the learned Judge, before whom the case was heard, referred the counterclaim to an Official Referee. The plaintiff Muff, continued counsel, was the holder of a debenture for £4,000 on the property and undertaking of the Improved Electric Supplies, Ltd. On March 6th, 1907, the shareholders passed a resolution for the voluntary liquidation of the company, and under his powers as a debenture-holder, Mr. Muff appointed the other plaintiff, Mr. Snowden, to act as Receiver and manager. Negotiations were then entered into with the defendants, Messrs. Cunnington & Alison, for the sale to them of the whole undertaking and business of the company, and as a result, on May 17th, 1907, an agreement was entered into between the parties, which provided that the vendor, with the concurrence of the Receiver, should sell to the purchaser the goodwill of the company's business and all the trade marks connected therewith, all plant, machinery, office furniture, patents, licences, and everything belonging to the business, as represented to the purchasers by the company's stock-book, all book and other debts due to the company or the Receiver in connection with the business, as stated in a schedule affixed, and all pending engagements, contracts, &c. Afterwards, defendants discovered that the stock-book fraudulently and grossly misrepresented the quantity, quality and value of the goods described in it to the extent of some £3,000, and that the schedule of book debts overstated the value of those debts, and under-stated the contra accounts. They alleged that the clauses in the agreement which he had read were warranties, and that by reason of this misrepresentation the plaintiffs had broken those warranties, with the result that defendants had suffered damage to the extent of some £3,000. They were induced to enter into the agreement, and deposit the sum of £3,500 and other considerations by the representations contained in the stock-book and schedule, which were produced to them by a Mr. Thompson, acting for the plaintiffs. Further, his clients alleged that the plaintiffs had not delivered to the defendants all the patents and licences connected with the business. Then counsel came to a curious phase in the case; he stated that by a collateral oral agreement to the agreement already mentioned, and with a view of keeping the business going until the consent of the Court was obtained, it was agreed that Messrs. Cunnington & Alison should go into possession of the business on May 17th, 1907, and remain in possession until the consent to purchase was obtained. This they did, and it was further agreed that the time for obtaining that consent should be extended for a month. On June 19th, however, said counsel, and why he failed absolutely to understand, plaintiffs, through their solicitors, suddenly put in bailiffs and ejected the defendants and prevented them from carrying on the business in any way. This state of things lasted a week. At the end of that period defendants were informed that the consent of the Court had been obtained to the purchase agreement, and they were allowed once more to occupy the premises and carry on the business. As a result of this action on the part of the plaintiffs, his clients declared that they had suffered considerable pecuniary loss and damage to their reputation and credit, and the business had been rendered much less valuable in consequence. They claimed in respect of this some some £540.

Referring to the stock, COUNSEL said that when defendants came to examine it they found it was very far short of what it was represented to be by the stock-book. The stock of lamps, for instance, was, in many hundreds of cases, found to be valueless, owing to the fact that the vacuum in them had been destroyed. The "silver" lamps were of such a character that they would have to be re-silvered, and in one case where the sum of £300 figured in the stock-book for arc lamps, they were known at the time, declared counsel, by Mr. Thompson to be scrap metal, and only of the value of scrap metal. Electric motors had been entered up in the stock-book, but they were not electric motors at all, but merely empty cases, the insides having been taken out before for some other purpose. Again, radiators were included, which in their turn were absolutely incapable of being fitted together and quite unmerchantable. Skilled electrical valuers who had gone carefully through the stock, had declared it to be worth, instead of over £4,000 as represented by the stock-book, at the outside only £1,900. As regarded the book debts there were similar misrepresentations, inasmuch as contra accounts had not been disclosed.

MR. ACLAND, K.C., for the plaintiffs, said that their defence to this counterclaim was that they had never sold the stock as stock at all, but had sold the business as a going concern. They denied that there was any misrepresentation whatever, and that the prices in the stock-book did not purport to be the actual value of the goods. Defendants had the fullest opportunity of ascertaining the value of the stock before entering into the agreement to purchase, and plaintiffs had never ejected defendants.

MR. HARRY PIGOTT ALISON was then called, and stated that he joined Mr. Cunnington in partnership to buy the business of the Improved Electric Supplies, Ltd. He was an electrical engineer of some 20 years' experience, mostly abroad, and Mr. Cunnington was carrying on business also as electrical engineer at the time they entered into partnership. After a series of interviews with Mr. Snowden and with Mr. Thompson, who, Mr. Snowden had said, "had his authority to furnish details"; and, after examining the stock-book, witness and his partner made an offer of £7,500 for the purchase of the business, including the book debts. Witness corroborated counsel's statements, and said that they took over the business as soon as the agreement was concluded, as it was essential that they should take early possession. There were orders which required immediate attention, and the goodwill was dropping away owing to the business having been neglected. In the meantime, they heard that the Court which was to consent to the purchase agreement, had suggested a modification with regard to the taking over of the book debts, but when the matter was referred to them (defendants) for consideration, they declined to agree. The next thing that happened was the appearance of the bailiffs, and the only reason plaintiffs had ever given for this ejection was that they were not likely to accept terms which were acceptable to the company's clients. Witness then proceeded to deal in detail with the stock-in-trade as set out in the stock-book, and compare it with a schedule he and his partner made after re-entering the premises, and inspecting the stock thoroughly they found that in point of numbers it did not come up to the description in the stock-book, and the quality was inferior. The stock of lamps, for instance, they found were all mixed up when they came to uncover the bins, and many of them were years old and quite useless when submitted to a test. They estimated that they had sustained a loss of £138 on the stock of lamps.

(To be continued.)

THE NEED OF CO-OPERATION IN THE ELECTRICAL INDUSTRY.

[COMMENTS AND CRITICISMS FROM THE TRADE.]

IN our issue of January 15th, in an article bearing the above title, we gave a summary of the contents of a pamphlet which had been sent to us on behalf of the provisional committee of the proposed Electrical League. We were not aware, at that time, that the pamphlet was to have so limited a circulation as we have since ascertained has been accorded to it. One would have supposed that the acknowledged leaders in electrical industry in all parts of the country would have been among the first to receive copies if their co-operation was desired, but it has been surprising to us to learn, after inviting a number of these to express their opinions on the subject, that this was not so. We have, ourselves, therefore, as the League or its preliminary organisation has practically no funds available, obtained from Mr. Borlase Matthews, the hon. secretary, a number of copies which we have forwarded to some of our correspondents. Perhaps any other readers

who may be sufficiently interested will apply direct to Mr. Matthews at 1, Victoria Street, S.W., enclosing 1d. stamp to cover the postage on the document under notice.

We have received many interesting communications concerning the proposed League. Some of them are couched in such strong terms that neither we nor their authors desire to publish them in the Electrical Review, but as far as we care to indicate their contents, they serve to prove to our mind that the writers by no means regard the proposal, as outlined in the pamphlet, as likely to lead to an ideal organisation being established which, while aiming to represent each different interest, shall also fairly represent them all.

Mr. H. A. Mavor, of Messrs. Mavor & Coulson, Glasgow, writes :—

"I have read the pamphlet on the need of co-operation in the electrical industry. While there are a great many true statements in the pamphlet, and while the situation is one requiring the most careful study, I am unfavourably impressed with the statement of the case as made in this pamphlet. If an effective combination is to be made, it must, I think, have a more definitely stated object as a basis of combination. You may be aware that recently an attempt was made to arrive at mutual agreement between British manufacturers on the price of standard articles of manufacture. This attempt served the purpose of showing the difficulty of dealing with the question, but it was unsuccessful. Another attempt might be made, but it would require to be backed by a strong representation of the manufacturing interest. If a campaign is to be carried out, the success will depend a great deal upon who is the leader.

"Between the lines of this pamphlet there is indication that one of the objects of the proposed association would be to see that the electrical industry got justice in a distribution of protective tariffs. When we have settled that tariffs are to be, this might form a definite object to be dealt with by such an association. Some of us believe that any such discussion is very premature indeed."

Mr. J. Stottner writes :—

"After reading through the pamphlet, I had to ask myself, 'What is the object at which it aims?' There seems to be a certain obscurity about the point it has in view. Why Parliament or legislature should be blamed for inadequate profits in our industry is incomprehensible to me. Parliament or legislature have not hindered the exploitation of electricity for a long time past. What should we say if we were in the position of our German competitors regarding the proposed tax on electricity?

"In my opinion the reason for the very unsatisfactory state of affairs in the electrical industry is solely an individual one. There is a nervous and senseless underbeating in practically every instance of competition, instead of an attempt to gain the confidence of customers on engineering points; in fact, the whole skill in obtaining contracts seems to concentrate itself in the one endeavour to 'sell cheap.'

"Now who is foremost to follow this principle? It is the home manufacturer himself. If we study the prices quoted by the few foreign concerns established in England, we find that they are in general considerably above those of the home producers. If these firms prosper under the same Parliament and legislation, we must look for the cause elsewhere. Electrical enterprises have been and are still floated in England to a great extent on a basis which in the long run can only lead to disaster. The amount of water in the capital at the outset is the stumbling block of even the best engineered scheme, and capitalists are naturally reluctant to invest in such undertakings, even should they be managed by sound and honest men. There is no wonder, then, that a certain stagnation in the electrical industry must be the ultimate result.

"There is no doubt that foreign firms are excellently organised in every detail. They generally work in friendly harmony with their competitors, and have constantly the economical point in view, combined with a desire to show a satisfactory return at the end of the year. They are enterprising, and do not mind risking a small amount in trying to establish themselves even in the most remote corners of the globe. They very rarely launch out in enterprises with no other object in view but to make money quickly for the benefit of a few individuals and afterwards let the matter go adrift. Their policy is honestly to gain the confidence of the public at large, and thereby to automatically provide for further capital. They never cease in their endeavours to educate the public as to the results which can be realised by the application of electricity, and thereby they are constantly creating new markets to the benefit of the whole industry.

"The welfare of an industry can be regulated neither by legislation nor by a league; it depends entirely on individuality."

Dr. Gisbert Kapp, before the receipt of the pamphlet, wrote as below :—

"My views on the position of the electrical industry have been quite recently given in the *Times Eng. Supplement*, and I have nothing to add. Moreover, should the pamphlet be a plea for 'tariff reform,' I should certainly decline to assist such a movement. No one who has lived some years in a protectionist country could honestly approve of a fiscal policy which is certainly detrimental to the industries of a country, taken as a whole."

Mr. S. Z. de Ferranti, before receiving the pamphlet, wrote to us as follows :—

"I think the whole tendency of modern business is to avoid excessive competition by some process or other. Combination, reasonably and fairly carried out, seems to be distinctly beneficial in this direction. The electrical industry, for one reason or another, seems to be conducted on lines altogether different from those of ordinary business, insomuch as competition is so severe that it does not appear to be possible to obtain any adequate return in this country. If this state of affairs could be improved upon by any process, I should think that it would be greatly to the advantage of the industry."

Messrs. Ernest Scott & Mountain, Ltd., say :—"We think that such an organisation cannot possibly injure the trade, and may do much good and useful work. There is no doubt that the industry has been very greatly hampered in the past by restrictive legislation, and if united action in the future can achieve any modification of these legal disabilities, or give assurance to the proprietors of electrical undertakings that the rights they hold will not be withdrawn, we believe that the electrical business and profession will be much brighter in the future for this country than the past has been."

Messrs. Elliott Bros. write :—"We have looked through the pamphlet on the subject of the Electrical League. There is no doubt at all that any effort in the direction of the united action should have the support of every one connected with the electrical business. There are a great number of matters which have seemed to be outside the scope of the existing Institution. The views set out in the pamphlet issued by the Electrical League seem to us to describe the position very well."

A correspondent, whom we will call "**A**," writes :—

"We do not appear to have received the pamphlet referred to, but, at the same time, we may say that we are strongly in favour of some such form of co-operation; at the same time, we feel that the root of the trouble is that foreign firms can sell plant at practically cost price in this country, they being assured that they can sell plant at a good profit in their own countries, owing to the same being protected by high tariff, and we are afraid that until the question of the free entry into this country of fully manufactured articles is dealt with, there will be not much benefit from co-operation among existing British firms."

By one authority of considerable eminence the proposal is described as "This latest freak."

Another correspondent ("**B**") holds that the difficulty realised in raising money for electrical enterprises is due to the financial world having no confidence in some of those who are associated with electrical finance. He prefers to look for orders and increase of business by legitimate means.

"**C**" comments thus :—

"Except as a valid excuse for another annual dinner I can see no prospective benefit from the League, which can hardly hope to be any more successful in benefiting the electrical industry as a whole than the other well-meaning but impotent associations that already abound."

"**D**" expresses himself as follows :—

"The scheme seems so much in the air that it is ex-

tremely difficult to say what the promoters actually have in mind as their ultimate object.

"That there is need for some steps to be taken to put the industry on a better footing is, no doubt, beyond question, but 'of the starting of associations there is no end,' and I feel that it is not so much the existing societies which are at fault as the apathy of the members. For some years past there have been complaints raised at intervals as to the composition of the Council of the Institution of Electrical Engineers, and of its not being in touch with the industry at large. There may be much in this, but I feel strongly that it is entirely due to the fact that the members as a whole have never made their views felt by the Council. It seems to me that all the machinery is there for doing the work which the League proposes to undertake, if only the members chose to see that it was put in motion.

"It has always been looked upon as an axiom that the Institution could only undertake technical, as opposed to commercial, work, but at the same time the two are so closely allied that there are very few matters which it could not successfully undertake, particularly through the mediation of the various sub-committees (Light and Power, Manufacturing, and so forth) which have been started. These committees are, as you no doubt know, quite a dead letter; occasionally they hold one meeting in the year, most of the time being spent in re-appointing themselves and drinking tea, but as often as not they do not meet for intervals of two or three years. Apparently one of the chief aims of the League is to bring pressure to bear on Parliament, or, at any rate, on the Board of Trade; and if this is so, it seems to me that there is much more likelihood of a deputation from the Institution attaining its end than one from a non-representative body such as this League is bound to be for many years to come. Besides which, their suggestions would always be open to the retort that they are only a section of the industry, whereas the Institution represents it as a whole, and if the latter had not seen fit to move in the matter there could be no great necessity for the change proposed, and so forth.

"The Institution has of late years been growing steadily in numbers and prestige, and I certainly feel that if it is to do full justice to the large responsibility undertaken in connection with the new building, it will have to extend its scope, and, above all, make itself looked upon as the mouthpiece of the whole industry. It is in a position to do so, since it is strong enough to be quite independent of the cliques which such bodies as the proposed League, or the Electrical Manufacturers' Association, are bound to represent.

"May I suggest that you should use your wide influence (provided you agree with me in this), to endeavour to prevail upon the members of the Institution to see that that body is capable of doing all that the industry has every right to ask of it?"

"E" expresses the opinion that the real programme of the League promoters is to persuade the public to put more money into industrial enterprises, their hope being to induce the public to do that by telling them that other nations are ahead of us, or that we are handicapped by being free to buy in the cheapest market. This our correspondent does not agree with at all. He believes that we are suffering partly from over-production of works, and although shareholders would suffer loss, the shutting-down of a few works might be a good thing for the industry. Manufacturers instead of working at a loss might imitate the blast furnace people, who reduce the number of their furnaces when remunerative trade does not exist for their full number. It is said that various electrical enterprises are suffering through want of money necessary for expansion, but shareholders generally manage to find money to support concerns which have deserved their confidence. The carrying out of tramway enterprises was a purely voluntary proceeding on the part of the companies, and they were not forced to carry them out, except on terms which they could ascertain beforehand as satisfactory commercially to themselves. It would not be difficult to show that many of these enterprises had been entered into without any adequate first counting of the cost.

(*To be continued.*)

BUSINESS NOTES.

Consular Notes.—New Zealand.—The Austrian Consul at Auckland, in a recent report, states that the telegraph system of New Zealand is in the hands of the Government. In 1907 there were in the Dominion 8,953 miles of line, with 27,031 miles of wire, and during that year 6,396,332 messages were sent, of which 6,160,080 were private and Press telegrams. The New Zealand telephone system, which also belongs to the Government, has 29 central offices and 76 sub-offices. A cable for communication between New Zealand and Australia on the one hand, and Fiji on the other hand, was opened on April 9th, 1902; on October 31st, 1902, it was extended to Bamford, Vancouver Island, and was opened for internal messages on December 8th, 1902. The cable route is from Doubtless Bay, New Zealand, to Vancouver, Canada, *via* Norfolk Island, Fiji and Fanning Island. The deep-sea portion of the cable—between Vancouver and Fanning Island—is the longest in the world. The opening of this cable caused a reduction in the very high rate to Europe. The rate now is 5s. per word, whether the message is sent *via* the Pacific Cable or *via* the Eastern Co. The Eastern Cable is generally used for communication with Europe, and the Pacific Cable for communication with Canada and the United States.

Russia.—The Austrian Consul at St. Petersburg reports that the Russian machinery industry had not generally a good year in 1907. The number of orders decreased as new installations were rare. In particular were conditions bad for the producers of small steam engines, which are gradually being ousted in favour of gas and naphtha engines. For the electro-technical industry, however, the year was very favourable. The demands from private sources were such that the Russian works as well as the branches of foreign works which have been established in Russia, were well supplied with orders. Owing to the crisis abroad, and particularly in Germany, the Russian works were obliged to themselves produce many of the articles which they are in the habit of purchasing abroad. A number of Russian towns have erected new plant or extended the existing plant, which has had a favourable effect on the industry. Most important was the demand for turbo and steam dynamos, motors, and transformers. The consumption of incandescent electric lamps is also increasing, and new works for the production of these articles have been erected. The demand for other electro-technical articles was also considerably better than in previous years. The imports of machines for industrial purposes amounted to 3,590,000 pouds, valued at 36,286,000 roubles in 1907, as against 3,461,000 pouds valued at 31,193,000 roubles in 1906. The imports of gas and naphtha motors has considerably increased, and further increase is anticipated. The gas engine is particularly favoured, and Germany and America have found good business in this article. Engines of 80 H.P. are preferred. The importation of steam engines has certainly increased, but the use of this class of engine shows a tendency to decline. The imports of dynamo machines, electric motors and transformers, have again increased, the home industry not as yet being in a position to satisfy the increased demand. Of the imports in this class, the following table shows the countries amongst which the trade was distributed:—

	1906. Roubles.	1907. Roubles.
Germany	20,778,000	22,035,000
Great Britain... ...	9,232,000	12,715,000
Austria	681,000	1,376,000
France...	384,000	261,000
Belgium	117,000	121,000

Brazil.—The Austrian Consul at Sao Paulo, in a recent report, states that the imports of machinery, mechanical apparatus, &c., in 1907 amounted to 12,667,982 milreis as against 6,696,502 milreis in 1906. The imports of machines and apparatus for electric lighting and power, in particular, show a large increase. This is due to the enormous development of the electrical plants, not only in the larger towns such as Sao Paulo, Campinas, Santos, and Riberao Preto, but also in the smaller towns of the interior with populations of from 3,000 upwards. Most of these town have now adopted electricity for lighting and power for industrial purposes at relatively small cost, owing to the existence of valuable water-power close at hand. The district will still, for many years, prove to be a valuable ground for industrial firms and capitalists interested in electrical undertakings. Petroleum, gas, &c., engines are being increasingly imported, the American product is gradually ousting the British, and is finding a good business owing to the general expansion of industry in the country. The machine industry of Brazil itself is as yet only very small. The works of the Companhia Mechanica e Importadora de Sao Paulo and other works are not in a position to compete with foreign goods, except in the case of the simplest articles.

E.C.C. Staff Dinner.—The second edition of what may be termed the new series of E.C.C. staff dinners was held at the Star and Garter Hotel, Wolverhampton, on Saturday, January 16th, Mr. William Bulloch (manager) presiding. The great increase in attendance over that of last year (74, as against 40), is an indication of the forty's enjoyment of the first event. The smoking concert, which followed, proved that the Electric Construction Co. possesses men of more than electrical parts. Advantage was taken of the occasion, to present a case of pipes to the accompanist, and of introducing an original song (designed and executed by E.C.C. men), in which the staff sang its own loyalty and the high praises of its popular chief.

Turkey.—It is reported that the Société de Tramways de Salonique proposes to devote a portion of the increase in capital recently decided upon to meet the expenditure on the provision of rolling stock, and the remainder to the purchase of the concession share of the Compagnie Ottomane d'Electricité, which works the concessions granted at one time to the late Sir A. Bartlett. The first of these concessions, which was issued for a period of 35 years, relates to the supply of light and power in Salonika, whilst the other concerns the working of an electric tramway in that city for a term of 50 years. It is estimated that the purchase price will amount to £40,000.

Several Arabian notables of Jerusalem have made application to the High Porte for a concession to supply electricity in this city, and to construct an electric tramway between Jaffa and Jerusalem.

Fire Tests.—The British Fire Prevention Committee's testing operations were started for the year 1909 last week, when some large doors were under fire test. Major O'Meara, C.M.G., Engineer-in-Chief to the General Post Office, represented the council of the Committee at the tests, and there was a large attendance of public officials.

Catalogues and Lists.—Messrs. Falk, Stadelmann and Co., Ltd., 83-7, Farringdon Road, London, E.C.—Several new trade lists have been issued relating to the "Efesca" specialities. One deals with the "Sirius-Efesca" tungsten lamps, which are now stocked in a wider range of voltages and candle-powers, 25-volt lamps of 10, 16 and 25 c.p., and 50-volt lamps of 12, 16 and 25 c.p. being available; a second deals with wireless cluster lights; a third is devoted to the "Efesca" lantern, in green enamelled steel, in various forms for different situations; the fourth describes the "Efesca" anti-jar lampholder, which is claimed to be especially useful for lighting mills, factories, workshops, railway platforms, &c., with metal-filament lamps; the last describes the "Efesca" auto-transformers. Copies of any of these lists can be obtained by members of the trade on application.

The Victoria Dynamo and Motor Co., Craven House, Kingsway, W.C.—Catalogue and lists relating to small electric motor lift gears, and their continuous current motors and dynamos.

The Electric Construction Co., Ltd. Bushbury Engineering Works, Wolverhampton.—Catalogue consisting of a number of useful and well-printed and arranged sections divided by a side thumb index, in which are contained particulars, including specifications, lists of prices, dimensional drawings, and other shipping information relating to their manufactures. All are brought together uniformly in a stout and serviceable binding case, in which there is the usual provision for adding or substituting new lists. The different sections in this excellent collection are as follows:—Midland c.c. motors; Staffordshire c.c. motors: S.P. c.c. motors (two sections according to size); S.C.P. c.c. motors; Staffordshire c.c. generators (two sections); S.C.P. c.c. generators; two and three-phase a.c. motors; rotor starters; auto-transformer starting panels; auto-transformer starters; electric haulage gears. Prices are given, with other particulars, in tabular form. We have no doubt that many of our readers will be anxious to secure a copy of this catalogue.

Messrs. Davis & Timmins, Ltd., York Road, King's Cross, N.—List showing (full size) some of their standard cable ends which are kept in stock. Both sides of the bolt holes are machined, thereby ensuring good contact. In a small table dimensions and prices per gross are set out.

The British Thomson-Houston Co, Ltd., Rugby.—The publications department of this company has issued another of its series of interesting cards reminding one of the virtues of its lamps. This time the B.T.-H. tungsten lamp is the subject, one's fancy being caught by a picture in colours of an apartment which, with its "fair women and brave men," would have looked far brighter had it been lighted with such lamps instead of candles—say, a hundred years ago! We believe there are some premises even to-day where the same remark would apply! The reverse side of the card gives a list of London addresses at which the lamps can be bought. One of the company's 16-pp. booklets relating to electric heating and cooking devices has also been received.

The James Keith & Blackman Co., Ltd., 27, Farringdon Avenue, E.C.—Fully illustrated catalogue, wherein are given descriptive notes and large views of the Keith 1908 steel plate centrifugal fan, in which there are embodied a number of improvements in fan design and construction. Double and single airlet fans are shown, and they are supplied either electrically or belt-driven. An accompanying booklet contains notes on "Fan Tests; Theories and Facts."

The Reason Manufacturing Co., Ltd., Lewes Road, Brighton.—New 8-page catalogue, revised and brought up to date, describing and illustrating a few neat fittings lately introduced by them for interiors and exteriors of shops and business premises.

Mr. G. Wuthrich, Norfolk Street, W.C.—Two lists relating to Oerlikon three-phase (totally enclosed) squirrel-cage motors, 50 cycles, for pressures up to 500 volts, one including motors from ¼—5 h.p. and the other from 6—36 h.p.

Messrs. Attwater & Sons, Hopwood Street Mill, Preston.—Small pamphlet relating to "Peerless" leatheroid insulation and giving figures of a puncture test of same; also a sample of the material.

Messrs. Wm. Coates & Sons, rope and twine manufacturers, Nottingham.—Small desk blotter on the back of which is a calendar for the first three months of 1909.

Callender's Cable and Construction Co, Ltd., Hamilton House, Victoria Embankment, E.C.—This is a bound catalogue of convenient size (184 pages), in the first 140 pages of which, after some general tables of weights, resistances, &c., of copper conductors, comparison of wire gauges, and tests of cables, there are given in tabular form numerous particulars regarding their manufactures as follows:—*Association grades* of single conductor vulcanised cables, twin conductor vulcanised cables, single conductor pure rubber cables, twin flexible and electrolier wire; also *non-Association* grades; then "specials," including twin flexibles, aerial cables, flexible trailing cables, motor-car flexibles, and twin shot-firing cables. The last 40 pages are devoted to Callender's cable code.

We are informed that the Electrical Co, Ltd., of 121, Charing Cross Road, are now in a position to deliver Aegma metallic-filament lamps of 50 c.p., 200 to 250 volts, with pear-shaped and round bulbs, and 100 c.p. with round bulbs; their price sheet will be ready in a few days.

Mr. Jens Orten Boving, 72 and 74, Victoria Street, Westminster, S.W.—New catalogue of the patent Zodel-Voith and the B.B. type flexible insulating couplings. A brief description of the standard and fly-wheel types, also of the patent reversible and the B.B. (high-speed) coupling, and tables of dimensions and prices of standard sizes are given. The use of these couplings in this country has, we understand, greatly increased. They are of British manufacture throughout, being made at Mansfield. Mr. Orten Boving, who is the sole manufacturer in the United Kingdom, and who will be pleased to send copies of his pamphlet to those interested, says that the couplings are being sold at a substantial percentage below the prices ruling on the Continent.

Messrs. British Insulated and Helsby Cables, Ltd., Prescot.—Pamphlet No. P 81 giving a description, with illustrations, of their Prescot welder for spot welding to replace riveting in sheet-iron and hollow ware.

The Armorduct Manufacturing Co., Ltd., London, E.C.—A large show-card has been issued by this firm with the object of impressing all who cast their eyes upon it with the virtues of the "Gral" metal lamp. The pictorial subject of the card is intended to represent the idea of "the Leading Light," one fair creature who carries a Gral lamp aloft—and who beggars all our description, we not being Byron—leading onward and upward a second of her sex whose proportions are somewhat slimmer. We hope this fair maiden revived under the glow of the "Gral"—we feel quite concerned to know. The company will forward a supply of these show-cards to contractors, or dealers interested therein.

The London Electric Firm, George Street, Croydon.—New leaflet, No. 123, giving prices and brief particulars of their self-sustaining winches.

The Reason Manufacturing Co., Ltd., Lewes Road, Brighton.—Eight-page pamphlet describing the new hand-wound time switches, and giving clearly printed interior views of same.

Dissolutions and Liquidations.—Mexican Power Development Syndicate, Ltd.—This company is winding-up voluntarily with Mr. A. W. Tait, Basildon House, E.C, as liquidator. A meeting of creditors will be held on February 1st.

W. G. Pye & Co., scientific instrument makers, Granta Works, Mill Lane, Cambridge.—Messrs. W. G. and W. T. Pye have dissolved partnership.

Mr. Justice Swinfen Eady in the Companies' Winding-Up Court on Tuesday, January 26th, made an order for the compulsory winding-up of the Maidstone Palace of Varieties, Ltd., on the petition of the Electric Light, Power and Hiring Co., Ltd.

Kevan Signs, Ltd.—A meeting is to be held at 120, Fenchurch Street, E.C, on March 1st, to hear an account of the winding-up from the liquidator, Mr. Edmund Heisch.

Electrical Instrument Manufacturers, Ltd., Freezywater, Waltham Cross—February 5th has been fixed for the public examination of Thomas Ward, at the Court House, Edmonton.

McPhail and Simpson's Dry Steam Patents Co., Ltd., Calder Works, Wakefield.—February 10th is the last day for the receipt of proofs for intended dividend, by the liquidator, Mr. J. W. Close, East Parade, Leeds.

Sir Hiram Maxim Electrical and Engineering Co., Ltd.—Notice is published of the release of liquidator (Mr. A. F. Whinney), on November 28th.

Bankruptcy Proceedings. — *Re* William Aubert, Jun., late of 16, Harp Alley, St. Bride's Street, E.C., gas and electrical engineer.—The receiving order in this case was made on November 24th upon the petition of Messrs. J. & W. B Smith, the act of bankruptcy alleged being the departure of the debtor on or about September 24th, 1908, with intent to defeat or delay his creditors. The debtor was also described in the petition as late of Tagg's Island Hotel, Hampton Court, present address unknown. A sitting of the London Bankruptcy Court was appointed to be held on Wednesday before Mr. Registrar Giffard for the public examination of the debtor. Mr. W. P. Bowyer, assistant Official Receiver, reported that the debtor had not surrendered under the proceedings; that he left his business premises some weeks before the date of the receiving order, but Mr. L. B. Linnett had been appointed as trustee in the interests of the creditors, and was carrying on the business on their behalf. Nothing was known of the debtor's whereabouts. Under those circumstances he applied for the examination to be adjourned *sine die*. His Honour made an order on those terms.

Electrical Exhibition.—From August to October this year there will be held an international electrical exhibition in the town of Brescia, Italy. The province of Brescia is rich in water-power, and many very large hydro electric works have been erected there, with the result that there is a considerable demand for electrical material and apparatus in the district. The general secretary is Dr. Philippe Carli, Camera di Commercio, Brescia.

Trade Announcements.—MESSRS. J. H. BUTCHER & CO., transfer printers, announce that, owing to expansion of business, they have built new premises at 506, Moseley Road, Birmingham, specially arranged and fitted with up-to-date machinery for producing transfers. Land is also available for future extension. Their telephone number is "South 383," and their telegraphic address remains unaltered, *i.e.*, "Solito, Birmingham."

MESSRS. NEVILLE KAYE & CO., LTD., engineers, Thanet House, 231-2, Strand, London, W.C.—This company has been registered to carry on an engineering business, more particularly to specialise in electric, hydraulic, hand-power lifts and cranes, electric lighting and plant installations. Mr. H. Neville Kaye, who is managing director of the company, was London manager to Messrs. A. & P. Steven. The machinery of the company will be made in this country, suitable works which have been acquired in Sigdon Road, Hackney, N.E., being now in course of equipment.

Mr. H. Wilford, who for some years has been manager for MESSRS. GENT & CO., LTD., at their Newcastle branch, has now joined their Leicester staff. Mr. A. E. Eats, who has hitherto been connected with Messrs. W. H. Allen, Son & Co., of Bedford, has taken up the management of the Newcastle district for Messrs. Gent.

THE DISTRICT ELECTRIC CO., LTD., of Wolverhampton, have recently opened a branch office at 3, New Street, Birmingham. Manufacturers and others are requested to forward catalogues to the latter address.

MESSRS. MORRIS-HAWKINS, LTD., ask us to state that Messrs. John Roberts & Co., of Cleveland Buildings, Market Street, Manchester, will cease to be their representatives for Lancashire after January 31st, and all communications after that date should be addressed to the company at 75B, Queen Victoria Street, London, E.C.

Proposed New Works.—A correspondent writes:—"It is rumoured that a well-known electrical engineering firm is about to erect works near Warrington, but no definite information is, as yet, available."

Book Notices.—*Japanese Patents.* By H. S. Bickerton Brindley, A.M.Inst.C.E. London: The British Press, Ltd. Price 5s. net.—This is a practical handbook to the Japanese laws relating to patents, &c. As the author points out, the Japanese are copying everything in the way of a foreign invention which is likely to find a market in their country, with extraordinary ability, and it is important that inventors and manufacturers should protect their products by patent. The area concerned is not merely that of Japan, but also of Formosa, Corea, and the whole of the countries bordered by the Pacific Ocean. Difficulties have been experienced in the past in obtaining valid patents, owing to the special requirements of the Japanese Patent Bureau, but the author having been long resident in Japan, and being intimately acquainted with the language and customs of the country, claims to possess exceptional qualifications for dealing with the subject. The book before us gives extracts from the Japanese patent law, as well as the regulations relating to "utility devices," designs and trade marks, and a complete specimen patent specification and drawing is appended. This is, we believe, the only handbook in existence devoted wholly to Japanese patents, &c., and should, therefore, prove indispensable to those interested in the subject.

Technical Dictionary in Six Languages. Vol. IV.—*Internal Combustion Engines.* By Karl Schikore. London: Arch. Constable & Co., Ltd. Price 8s. net.—This volume forms the fourth of the excellent "Deinhardt-Schlomann series" of technical dictionaries, of which we have had occasion to speak so highly. The series stands alone, not only in respect of its polyglot character, dealing, as it does, with German, English, French, Russian, Italian, and Spanish, but also with regard to the arrangement of its contents. Wherever possible the definitions are accompanied by a self-explanatory drawing. The definitions are grouped in order of subject, and a full alphabetical index is provided, by means of which the position of any term can be found at once; a separate index is given for the Russian language, which cannot be combined alphabetically with any other. In the volume under review, gases and oils, the theory of internal combustion engines, materials and their manipulation, the construction, equipment, and erection of engines, complete plants, working and testing, and economics are dealt with in separate sections. We note that Mr. Deinhardt has retired from the joint editorship of the series; the remaining volumes, of which some seven or eight were projected, will be edited by Mr. A. Schlomann alone. From experience, we can vouch for the usefulness and completeness of these dictionaries, which are, as we have said, unique and indispensable to anyone who has to consult or translate foreign technical articles and treatises.

We have received from the CHARLES URBAN TRADING CO., LTD., whose magnificent establishment in Wardour Street we visited some months ago, a souvenir brochure describing their work, and a copy of the *Journal* of the Royal Society of Arts, containing a report of a paper by Mr. G. Albert Smith on "Animated Photographs in Natural Colours."

"Die Kraftfelder." By V. Bjerknes. Brunswick: Fried. Vieweg und Sohn. 1909. Price M. 7.

"Vectors and Vector Diagrams Applied to the Alternating-Current Circuit." By W. Cramp and C. F. Smith. London: Longmans, Green & Co. 1909. Price 7s. 6d.

"Elektrotechnik in Einzeldarstellungen," Heft 13. Brunswick: Friedr. Vieweg & Sohn. Price M. 5.

"Horse-Power Computers," for Steam and Petrol Engines. By H. A. Golding. London: Chas. Griffin & Co. Price 5s. and 6d. respectively.

LIGHTING and POWER NOTES.

Acton.—With regard to the lighting of the U.D.C. dust destructor buildings, which adjoin the electricity station, a further report was presented to the Council by the electrical engineer, who said that the cost of electric light of 1,796 C.P. for 3,800 hours per annum would be £71, and for 2,500 hours £29. Gas lighting, on the same figures, with gas at 2s. 9d. per 1,000, would be £69 for 3,800 hours, without any allowance for the consumption of gas on the by-passes when the lamps were not alight. He declared that, candle-power for candle-power, electricity would prove to be the cheaper illuminant. In a joint report by the surveyor and electrical engineer, the cost of the installation was given as £109 in respect of electricity and £47 in respect of gas, but the former, it was explained, included the provision of a transformer in order that alternating current might be used. After discussion, the Council decided by seven votes to four in favour of lighting the buildings with gas.

Andover.—The B. of T. has revoked the 1905 E.L. Order.

Barbadoes.—A meeting has been held in Barbadoes to consider a proposed scheme to establish a system of electric lighting in the island under control of a company to be called the Barbadoes Electric Supply Corporation, Ltd. The capital is to be £50,000, of which £30,000 will be in 6 per cent. preference and participating shares of £1 each and £20,000 £1 ordinary shares. After a discussion as to the probable success of the scheme, 950 shares were subscribed among those present.—*Agricultural Reporter.*

Beckenham.—The U.D.C. has decided to sell free-wiring installations to customers on the hire-purchase system, at the original net contract price, plus 5 per cent. for supervision and less 1½ per cent. for depreciation. The hiring agreement is to be for five years, and the annual payment is to be an equal sum on the principle of an annuity based on 5 per cent. interest.

Belfast.—At the monthly meeting of the Harbour Trust, the Works Committee submitted a joint report from the engineer and the electrical engineer as to the terms on which the Corporation would contract to supply the electricity required for lighting and power purposes on the harbour estate, and recommending that under the circumstances the existing electric lighting station buildings be altered, and that additional plant, consisting of one boiler, one steam dynamo with the requisite condensing plant, four arc lighting dynamos, and an overhead traveller, &c., be provided at the station. It was recommended that the existing buildings be altered and that additional plant be provided at a total estimated cost of £12,000. The Commissioners have to provide for the new graving dock about 50 arc lamps, and this will increase the output by about 150,000 units. Sir Otto Jaffee hoped that some arrangement would be come to with the Corporation, and ultimately a sub-committee was appointed to confer with the Electrical Committee of the Corporation.

Bradford.—The Electricity Committee has again debated the proposed £50,000 extension scheme, referred back by the Council. The Committee decided on adopting the scheme, and resolved to recommend the acceptance of the B.T.-H. Co.'s tender for two 3,000-KW. turbo-alternators with Worthington condensers.

Canada.—The provincial power scheme is meeting with success in Ontario. The following towns have decided to take power from the Hydro-Electric Commission at prices varying according to situation:—Amherstburg, Bothwell, Chatham, Comber, Dundas, Elmira, Essex, Glencoe, Lesmington, Norwich, Port Stanley, Ridgetown, Simcoe, Sandwich, Stratford, Tilbury, Tillonsburg and West Lorne. Only the City of Brantford and two small towns voted down the by-law. The power situation at Chatham is interesting. The Hydro-Electric Commission quoted a price of $36.25 per H.P. per year, but the Colonial Engineering Co., of Montreal, offered to supply power to Chatham users at $20.15 per annum per H.P. This low quotation is justified by the abundant supply of natural gas of good quality in this neighbourhood.

Chipping Norton.—With one dissentient the T.C. has decided to withdraw its opposition to the application of the Electric Light and Power Co. for a prov. order for electric lighting, on the understanding that clauses are inserted that cables be forthwith laid in certain parts of the town, and that the company pay the costs incurred by the Council in the matter.

Dumfries.—On Tuesday night, last week, the vigorous ringing of numerous church and other bells brought the inhabitants of this town into the streets in large numbers. It appeared that an outlet pipe of the gas works had burst, the gas in several parts of the town had been cut off, and in fear lest through its being turned on again, the consumers who were asleep should be suffocated, it was decided to adopt this novel means of warning them. Lucky gas consumers!

Felixstowe.—The U.D.C. has sealed the agreement for the purchase of the undertaking of the Suffolk Electricity Supply Co., Ltd.

Finchley.—The U.D.C. having decided to apply to the L.G.B. to sanction a loan of £2,000 for a scheme of arc lighting, the North Middlesex Gas Co. has asked for an assurance that no part of the contemplated expenditure shall be incurred and no work commenced until after the L.G.B. inquiry, at which it intends to appear.

Herne Bay.—The gas company has informed the U.D.C. that it intends objecting to the Council's application for a prov. order for electric lighting.

Hertfordshire.—The C.C. is to oppose the Watford Urban District Council Bill, 1909, which seeks, *inter alia*, to confer powers upon the local authority in connection with its electric lighting undertaking. Opposition is also to be offered to the North Metropolitan Electric Power Supply Bill, 1909, and objections are to be lodged against the Chesham Electric Lighting (Extension) Provisional Order, 1909, with a view to securing protection for the county interests.

Heston and Isleworth.—The L.G.B. has written the U.D.C., declining to assent to a loan for the extension of the Council's electric light undertaking until it has an assurance that the Council will take definite steps to get rid of the deficit on the revenue account, amounting to £1,204, and the deficit of £1,928 on the account for free wiring consumers' premises, which, the L.G.B. points out, the U.D.C. had no statutory power to undertake. As some of the work for which the loan was sought had been already carried out, the L.G.B. would deduct £925 for the loan, representing a sum equal to the principal that would have been repaid if a loan had been obtained before the work was actually commenced. The U.D.C. has directed a reply to be sent that it undertakes to set aside annually an amount sufficient to extinguish the deficiencies in seven years.

London.—L.C.C.—The following loans have been completed:—Bermondsey, £10,637, Hammersmith, £10,000, and Stepney £9,500, for electric lighting purposes; and Poplar £14,599, for a dust destructor. The Finance Committee reports regarding a proposed loan for electric lighting for the Bermondsey Council, that it recommends the Council to grant £3,886 out of an applied for £4,246, on condition that the loan be taken up at once at £3 17s. 6d. per cent. per annum, interest payable quarterly, the principal to be repaid by equal annual instalments as to £246 for land within 41 years, as to £1,797 for mains within 30 years, as to £1,203 for house services within 12 years, and as to £640 for meters within 10 years. In regard to a Marylebone loan of £4,426, repayable in 50 years, sanctioned in December, for sub-station alterations, the Council is now about to make the advance out of the Superannuation and Provident Fund at £3 17s. 6d. per cent. per annum interest.

Hammersmith.—The Electricity Committee reports having been in negotiation with the owners of the exhibition grounds and buildings in Wood Lane for a supply of energy to future exhibitions. The company is prepared to enter into an agreement to take current for lighting and power purposes for five years from January 1st, 1909, and to use the Council's supply in preference to any other supply. The electrical engineer is of opinion that by a capital expenditure of £575 for transformers, &c., the Council can supply a maximum demand of 1,700 KW. This supply, however, could be increased to 2,200 KW., by laying an additional main, but this would increase the estimated cost of furnishing the supply to £2,025. The Council is to agree to supply electricity up to 2,200 KW. maximum demand.

Southwark.—The B.C. has appointed a committee to meet the London Electric Supply Co.'s representatives with a view to coming to an arrangement as to the future of the municipal supply.

Stepney.—For the 12 months ending January 9th, 1909, the maximum load was 108,274 equivalent 30-watt lamps, as against 94,355 in the previous 12 months. The units generated from April 1st, 1908, to January 9th, 1909, were 5,598,377, as against 4,665,345 in the corresponding period ended January 9th, 1908.

Mexico.—The Guanajuato Power and Electric Co. is at present engaged in the construction of a central electricity station on the banks of the River Angulo, in the State of Michoacan. The plant will have a capacity of 4,000 H.P., the energy generated will be transmitted to the mines in the State of Guanajuato for power purposes.

Neath.—The R.D.C. has received the sanction of the L.G.B. to a loan of £7,000 for the purchase of the power station. A further loan of £11,000 for other purposes in connection with the scheme has not yet been sanctioned.

Newhaven.—The R.D.C. has decided to enter into an agreement with Brighton T.C. for the supply of electricity for lighting to Black Rock, in the parish of Rottingdean.

Perth.—The heavy flooding last week caused a serious breakdown in the electrical supply, and much inconvenience was caused to shopkeepers and others, candles having to be resorted to for light. In one establishment no fewer than 800 candles were in use. The experience was a novel one, as the electricity department has been practically immune from trouble of this description. The tramway system was not affected.

Reigate.—A L.G.B. inquiry was held on January 19th into the application of the T.C. for a loan of £4,000 for electric lighting purposes. There was no opposition.

South Africa.—Johannesburg.—It is reported that a new company called the Rand Mines Power Supply Co., with a capital of about £2,000,000, will shortly be registered. This scheme has been formulated by Messrs. Harper Bros., London, for carrying out contracts arranged with fifteen Rand mines, and it is stated will be worked in unison with the Victoria Falls Power Co., who are understood to be financing the project.

The capital of the Victoria Falls Co. is to be increased to £3,000,000, with a view to providing further power stations, including, presumably, the above mentioned.

Springhead.—The B. of T. has informed the U.D.C. that it intends to revoke the E.L. order. When the matter came before the Council, it was stated that although the town was not actually mentioned in the Oldham Corporation Bill for additional electrical powers, neighbouring authorities were mentioned in the Bill, and it was considered that Springhead could be included in that clause.

Watford.—The L.G.B. has informed the U.D.C. that it cannot sanction a loan of £80 applied for in respect of work already done, and the sum is to be paid out of revenue. The Board sanctioned the remainder of the loan amounting to £1,750.

For fitting up new public lamps the electricity department has decided to charge the Council 35s. per lamp.

West Ham.—The electrical engineer has reported that under the existing arrangements, the annual cost of the collection, repairs, and capital charges in connection with the prepayment slot meters placed in the Council's artisans' dwellings and other private houses is £251, and the revenue from the electricity supplied through these meters was £362 for the year ended March last. The Council is to place all matters in connection therewith solely in the hands of the electrical engineer. Sales and meter departments are to be added to the electricity premises in Romford Road, at an estimated cost of £330, and the stores are to be extended at a cost of £125.

TRAMWAY and RAILWAY NOTES.

Bath.—The Board of Trade has recently confirmed the Bath Electric Tramways (Light Railway Amendment) Order, 1909, amending the Bath and District Light Railways Order, 1901.

Cardiff.—Mr. W. Harpur, the borough engineer, and Mr. Arthur Ellis, the electrical engineer and tramways manager, submitted a joint report to the Corporation on Tuesday, on the causes of the present unsatisfactory state of the tramway tracks. The Cardiff track, they said, was amongst the first laid in the kingdom, and the defects were now becoming noticeable. The cause of rail corrugation had not yet been solved, but another cause of trouble was the heavy traction engine and steam locomotive traffic in the streets, which was extremely destructive to the tramways. The substratum underneath the concrete foundations had been damaged by leakages from water mains, which had so softened the substratum as to turn it into a bog. The cost of repairing the tracks was estimated at £11,175. The question of reconstructing the tramways should not be entertained at present, for both gentlemen believed the track would last seven or eight years more. If the recommendations for repairing on a large and general scale were carried out immediately, with a system of keeping down corrugations, it was anticipated that the immediate result would be to effect an annual saving in cost of maintenance during the next few years. The report was referred to the Tramways Committee

Coatbridge.—The Glasgow T.C. Committee has had under consideration a letter from the town clerk of Coatbridge, making application for an extension of the Glasgow Corporation tramways from the terminus at Baillieston eastwards to join the western extremity of the local tramway company's lines at Langloan, Coatbridge.

Continental Notes.—Russia.—A remarkable instance of the difficulties attending the working of a Russian tramway is afforded by the experience of the Société des Tramways de Tiflis, which is a Belgian company domiciled in Brussels, and in which the Helios Electricity Co., of Cologne, is largely interested. It appears, on the one hand, that the agreement with the town authorities has proved unfavourable to the company, whilst on the other hand, the tramway men have not only wanted to determine the amount of their wages but also the number of men to be employed. The attitude of the employés, it is stated, actually prevented the company from dismissing men who were not indispensable, the result, in conjunction with the unsatisfactory agreement, being that the working expenses were very high and the interests of the undertaking were seriously prejudiced. The situation reached such an acute stage that the company asked the State General Governor for permission temporarily to stop the service in order that time might elapse so as to engage an entirely new staff. The intervention of the Governor has, however, opened the prospect of an alteration in the agreement with the town authorities, and as the tramway men are also now ready to negotiate for a fresh regulation of their relations with the company, the latter has resolved to abstain from a suspension of the service for the present.

Italy.—The Municipality of Genoa has signed the act of concession in respect of a very extensive motor-omnibus service which will comprise all the principal streets not served by the electric tramway system.

A company is being formed for the purpose of constructing and working an electic tramway from Biella to l'Hospice d'Oropa. Another company is being formed for the construction of an electric tramway from Varese to Angera. In the last-named instance it is expected that a substantial subsidy will be granted by the State, the Province of Como and the municipalities interested.—*Board of Trade Journal.*

Dunfermline.—A new complexion has been given to the alleged delay in the construction of the tramways, by a letter received by the town clerk from Guild & Shepherd, W.S., Edinburgh. The agents state that although a period of nearly three years has yet to elapse before the powers granted to the company shall cease, they are instructed by Mr. Balfour to say that he is about to make the necessary financial arrangements, and sees no reason why the tramways should not be in operation before the close of this year, providing the usual facilities are given for making rapid progress during construction.

East London Railway.—In the course of his address to the shareholders of this unhappy railway company, Lord Claud Hamilton made some interesting remarks on the question of electric traction which we extract from the *Financial Times* report:—"The chief unsatisfactory feature was the continued decrease in passenger receipts, mainly due to the discontinuance of through-working over the line, arising from its not being installed with electricity. Some allowance must also be made for the competition of electric trams and motor-omnibuses, but non-electrification was the main factor. This matter had been considered, but the general managers advised the committee that they could not at present recommend electrification. It was disappointing, because it meant delay for an indefinite period, but he trusted that, if the experience of the Brighton Company with regard to the experiment on its South London section were satisfactory, matters might assume another shape. Unfortunately, they had no reason at present to think that it was certain to be satisfactory, because the contract had taken much longer to complete than was anticipated, and it was rumoured that the estimates had been greatly exceeded. It remained to be seen whether that line could be worked cheaper than the third-rail or low-tension direct-current system. So far, there was only one instance in this country of an electric railway worked by the overhead or single-phase system, and that was on the Midland Railway between Lancaster, Morecambe and Heysham, which was only opened for traffic in April last, so that it was too early to learn with certainty as to its advantages or disadvantages. This was the more remarkable, as the single-phase system was being extended on the Continent and in the United States. In this country, although electric working of railways was much appreciated by the public, its extension was very tardy. There must be some good reason, and he suspected it was that electrical working on the low-tension direct-current system, as compared with steam, had proved too costly in this country. It remained to be seen whether the single-phase system would prove more economical. The action of the lessee companies in hesitating to proceed at present with the electrification of the line could, therefore, be understood." If they were to go to arbitration on the question as to whether the Metropolitan and Metropolitan District Railways were fulfilling the obligation they virtually undertook when they became parties to the lease, the board felt there was little chance of obtaining a favourable award under existing circumstances, as an arbitrator in all likelihood would decide that due time must be allowed to judge of the working of the single-phase system on the Brighton line. They, therefore, advised the shareholders to wait.

Heston and Isleworth.—The U.D.C. has decided to petition against the Bill of the London United Tramways Co. so far as it seeks to extend the time for the construction of the electric tramway from Hounslow to Staines.

Liverpool.—At a meeting of the Parliamentary Committee of the Corporation on Monday, January 25th, it was decided to recommend the City Council not to proceed with a poll of the ratepayers on the question of "Trackless Tramways." When the subject was discussed at a statutory meeting of ratepayers a week previously, the clauses in the Corporation's Bill relating to trackless tramways were defeated. The opposition was not directed against the system itself, but against the powers which it was sought to obtain to enable the Corporation to carry over it goods, wares and merchandise.

The annual return of the electric tramway traffic, presented at the meeting of the Tramways Committee on Friday, showed that the receipts for 1908 were £562,028, as against £571,929 in 1907, while the passengers, who numbered 121,927,383, represented a decrease of 2,115,356. Despite the reduced patronage, the mileage earnings had been maintained at a satisfactory figure of 11·02 per car-mile. A more favourable report was given concerning the first-class car service, and it was decided to continue the experiment for another six months.

Liverpool—Southport.—During a heavy fog on Thursday morning, last week, a collision occurred on the electrical section of the L. & Y. Co. near Marsh Lane Station. A train proceeding to Southport ran into a stationary train, the leading motor coaches in both cases being damaged, and subsequently taking fire. Subsequently another train proceeding on an adjacent line was pulled up apparently by the cutting off of power from the section, almost opposite the burning trains, and it also caught fire. Fortunately, the only serious casualty was in the case of one of the motor-men, the passengers escaping practically unhurt. The railway company has held an inquiry into the occurrence, but exact details are still wanting.

Lieut.-Col. Druitt has reported to the B. of T. concerning the collision between a Liverpool Overhead Electric train and the buffer stops at Seaforth Station on December 19th last. He considers that the accident was due to the driver misjudging the speed of the train, and recommends that when in a greasy condition the rails should be sanded by hand, sanding arrangements not being provided on the coaches.

Llandudno.—The U.D.C. has appointed a Committee to consider the question of purchasing the undertaking of the Great Orme Tramway Co.

London.—An inquest was held on the 25th inst. regarding the death of a boy who, while riding behind a brewer's dray in Archway Road, was killed by an electric car, which collided with the dray. Owing to a defect in the car equipment, the driver was at the time driving from the rear of the car, and the jury considered that a car in such a state as to require driving from the rear ought not to have been allowed to proceed.

Manchester.—The "trackless trolley" system, which the Corporation purposed adopting for some suburban portions of the area, does not meet with unanimous approval. The proposal embodied in a Bill intended to be introduced into Parliament next session, was the outcome of visits paid some months ago by a deputation representing the Tramways Committee to Germany and Austria. At a statutory meeting last week, called to obtain the ratepayers' sanction to this, amongst other proposals embodied in the Bill, there was considerable opposition. A majority of those present—of course a mere fraction of the ratepayers—voted against the trackless trolleys. All that could be done, in these circumstances, was for the Corporation to have a poll of the ratepayers, but it has been intimated that, so far as the Tramways Committee is concerned, it will abide by the decision of the meeting. It may be taken for granted that for the present, at any rate, the proposal will not be pursued.

South Shields.—A report prepared by Messrs. Charles H. Gadsby and Harley H. Dalrymple-Hay on behalf of the promoters of the Tyne Tube scheme has been placed in the hands of the Parliamentary Committee of the Corporation. From this it appears that the route of the proposed line is nearly straight; it will be laid with a descending gradient from each terminus, with its lowest point under the river. The northern terminus will be within 250 yards of the N.E.R. Co.'s station. The South Shields terminus will be at the gate of the railway station. The Tynemouth and District tramways, which pass the northern terminus, carry about 2,200,000 passengers per annum, and the South Shields tramways pass the southern terminus, and carry 7,000,000 passengers every year. The Tyneside tramways have their eastern terminus close to the northern terminus of the proposed railway, and carry about 4,700,000 passengers per annum. The station platform at South Shields will be about 25 ft. below street level, and will be easily reached by steps without lifts. At North Shields the platforms will be about 110 ft. below the surface, and electric lifts will be used. The length of the line will be about ¾ mile, and it will be possible by means of a single train through a single tunnel to operate a service of about 6 minutes' interval from each side. The estimate of the engineers for the completed railway, including rolling stock and all preliminary expenses and interest during construction, is approximately £200,000. The report deals with the present means of transit, pointing out that at the point of the proposed railway the river is 400 yards wide, and the only means of crossing it are the three ferries. The fare proposed would be 1d. for the single journey, with no reduction for the return, or at the rate of 1·33d. per mile. The Act authorises the railway to charge for the carriage of parcels at rates ranging from 3d. for 7 lb., to 1s. 3d. for 56 lb., and bicycles at 3d. each. The estimated revenue is approximately £25,000 per annum, and working expenses £9,188.

Wallasey.—By a poll of the ratepayers of Wallasey on Saturday, January 23rd, the Improvements Bill promoted by the Council for the next Session of Parliament was approved, excepting that part relating to the construction of a tramway from Mill Lane to Warren Drive. At a statutory meeting held previously the ratepayers voted in favour of a route through Breck Road and Wallasey village, which it is generally suggested is the more popular route.

TELEGRAPH and TELEPHONE NOTES.

Australia.—The second series of tenders for the installation of wireless telegraphy in Australia has closed, in the same manner as the former, none having been accepted. These tenders were for establishing wireless stations on the coasts of Victoria and Tasmania, linking up King Island and the Furneaux group. The Postmaster-General decided that the present state of the finances of the postal department would not justify him in accepting any of them. Not one of the present tenderers was prepared to undertake the installation of the duplex system.

Paris Telephones.—*Telephony* reports that a fire recently occurred at the new (temporary) exchange. The damage was not serious.

Telegraph Interruptions and Repairs:—

	Interrupted.	Repaired.
Port Arthur-Chifu	March 9, 1904	
Pontianak-Saigon	Sept. 16, 1908	
Medan-Penang	Dec. 22, 1908	
Malta-Zante	Dec. 29, 1908	
Paramaribo-Martinique	Jan. 11, 1909	
Seattle-Sitka	Jan. 13, 1909	Jan. 19, 1909
Djedda-Sonakim	Jan. 18, 1909	Jan 21, 1909
Falmouth-Bilbao	Jan. 19, 1909	
Tourane-Amoy	Jan. 19, 1909	

CONTRACTS OPEN and CLOSED.

OPEN.

Accrington.—The Electricity Committee invites tenders for the supply of stores and uniform clothing for the year ending March 31st, 1910.

Australia.—SYDNEY, N.S.W.—April 28th. Branching metallic multiple magneto switchboard at the William Street telephone exchange. See "Official Notices" December 18th.

QUEENSLAND.—Telephone material for the Postmaster-General's Department. See "Official Notices" January 22nd.

BRISBANE.—May 31st. Branching multiple magneto switchboard at Toowoomba. Tenders to the Deputy Postmaster-General, Brisbane. Tender forms from, and deposits payable at, the Australian Commonwealth Offices in London, 72, Victoria Street, S.W. Particulars may also be seen at the offices of the ELECTRICAL REVIEW.

Belfast.—February 4th. Telegraph stores, wire, batteries, &c., for a year for the Midland Railway Co. Forms of tender (No. 27), 6d., Mr. Ellis, Stores Superintendent, York Road Station, Belfast.

Belgium.—ANTWERP.—February 16th. Two generating sets are required by the Commandant du Génie, Antwerp, for the station at the new military hospital. Particulars from 15, Rue des Augustins, Brussels, for 10d.

Birkenhead.—February 1st. Stores for the Corporation electricity and tramways departments. Mr. W. Wyld, Borough Electrical Engineer and Tramway Manager.

Birmingham.—February 8th. Stores for the Tramways Committee. See "Official Notices" January 15th.

Blackburn.—February 16th. Stores for the Electricity and Tramway Committee. See "Official Notices" to-day.

Bolton.—A correspondent says that the Tramways Committee will shortly be in the market for additional cars, including several of the double-deck type.

Bradford.—January 30th. 200 steel tram tires for the Corporation. See "Official Notices" to-day.

Clacton.—February 17th. Overhead travelling crane for the U.D.C. electricity works. See "Official Notices" to-day.

Germany.—COLOGNE.—February 20th. A very large order is to be given for battery material by the Prussian State Railways Administration. Particulars are available, against 1s. P.O., at k. Eisenbahndirection, Dornhof, 28.

DRESDEN.—February 2nd. Tenders are required by the Stadtrath for 5 000 kg. of hard-drawn naked copper wire, of 8 mm. diameter, for overhead tramway conductors. Particulars may be obtained free from the Kanzlei am See 2, II, Room 32.

Edinburgh.—January 30th. Electrical installations at Torpnichen Place Police Station and at the Corn Market, Gorgie. F. A. Newington, Engineer, Electricity Supply Station.

Leeds.—February 25th. Stores for the Corporation Electrical Department. See "Official Notices" to-day.

London.—ISLINGTON.—February 5th. Electrical and engineers' stores for the Council. See "Official Notices" January 15th.

BERMONDSEY.—February 15th. Various materials for the Council electricity and destructor works. See "Official Notices" January 22nd.

MARYLEBONE.—February 16th. Stores for the Council's electricity department. See "Official Notices" January 22nd.

HACKNEY.—A proposal has been before the Council for inviting tenders for cables, troughing and jointing materials for the electricity works for three years, with the option to terminate the contract at the end of the first or second year.

STEPNEY.—February 17th. Electric light installation at Redman's Road Elementary School for the L.C.C. See "Official Notices" to-day.

Manchester.—February 10th. Storage battery with reversible booster, switchboard, wiring, &c., for the Waterworks Committee. See "Official Notices" to-day.

Plymouth.—January 30th. Stores for the Corporation electricity department. See "Official Notices" January 8th.

Portsmouth.—February 15th. Coal, also various stores for the Tramway Committee for one year. See two "Official Notices" to-day.

Roumania.—The municipal authorities of Ploesti are about to invite tenders for the construction of an electric tramway in the town.

Sheffield.—February 5th. Stores for the Tramways Committee. See "Official Notices" January 15th.

Spain.—It is stated that the Spanish naval authorities require tenders for installing wireless apparatus on their new dispatch-boat *Giralda*.

CLOSED.

Barry Railway.—Messrs. Pope's Electric Lamp Co., of Willesden, have received the contract for incandescent electric lamps for one year for this railway company.

Beckenham.—The following tenders have been accepted for the electricity undertaking:—

British Thomson-Houston Co.—Meters, £153 11s.
Lucy & Co., Oxford.—Lead boxes, 6s. 8d.; triple lead boxes, 7s.; cut-outs, 6s. 4d.; triple cut-outs, 11s. 6d.

Bradford.—The Corporation Electricity Committee has accepted the tender of the British Thomson-Houston Co., Ltd., for two 3,000-KW. turbo-alternators with Worthington condensing plant.

Canada.—WINNIPEG.—The City Council held a special meeting early this month for considering the recommendations of the Board of Control dealing with the power tenders, and of the Power Committee, with reference to the offer of the Street Railway to supply power to the city. The following tenders were accepted:—

John Gunn & Sons, Winnipeg, for works at Point du Bois, $779,100.
Northern Aluminium Co., Shawinigan Falls, for aluminium transmission cable at 23½ cents per lb.=$14 4,050.
Manitoba Ironworks, Ltd., for steel towers for the power works at $3.90 per 100 lb. Estimated total, $87,550. (The Ontario Wind and Engine Co. tendered lowest but did not secure the contract, as the successful tenderer offered to do 5 per cent. more riveting.)

The offer of the Railway Co. was declined.

Falkirk.—The E.L. Committee has accepted the offers for meters of Messrs. Ferranti, Ltd., and Venner & Co., and for electrolytic meters of the Bastian Meter Co., Ltd., and the Reason Manufacturing Co., Ltd.

Glasgow.—The Tramway Committee has accepted the following tenders:—

Special track work—Lorain Steel Co.
Lewis bolts, &c.—W. C. Yuille & Co.
Armature pinions—Alfred Wiseman.
Patent fastener tape—R. S. Dickson & Co.

Hull.—The Corporation Property Committee has accepted the tender of Mr. Harrison for wiring the City Hall for electric light.

London.—POPLAR.—The tender of Messrs. Nicholds and Reynolds, at £297, has been accepted for the erection of reinforced concrete buildings (workshops, messroom, lavatory and storeroom) at the central generating station.

L.C.C.—The Highways Committee has accepted the tender of Messrs. T. W. Ward, Ltd., for the purchase of about 2,300 tons of old rails and other permanent way materials removed from the several tramway routes which are now being, or are about to be, reconstructed for electric traction, at £2 10s. 3d. a ton. The total amount to be received will be about £5,778.

The following tenders were received for the supply of wiring materials for use at Camden Town electricity sub-station:—

Edison & Swan Co. ..	(accepted)	£84 (less 2½ per cent.)
Pinching & Walton		68
Veritys, Ltd.		68 " "
General Electric Co.		67
Johnson & Phillips, Ltd. ..		74
Spagnoletti, Ltd.		79 " "

By the direct employment of labour the Committee is to make, at a cost of about £58, certain alterations in the electric lighting of the recreation rooms at the Wandsworth, Poplar and Stamford Hill car-sheds.

For the supply of certain electrical shop machinery for the central car-repair depôt, the following tenders were received from selected firms:—

Tangyes, Ltd.	(accepted)	£782
John Holroyd & Co., Milnrow		1,122
" " "	(alternative)	1,115

For the supply of five steam-heated impregnating cylinders required at the same depôt, the following tenders were received:—

Heenan & Froude	(accepted) £152
Mountain & Gibson	162
A. Goodwin & Son	184
East Ferry Road Engineering Works Co.	232
Thames Ironworks, Ship-Building & Eng. Co. ..	275

Messrs. Heenan & Froude are also to supply a water cooler and accessories for the air compressor at the depôt, at £56.

(Continued on page 183.)

ELECTRICITY IN AN INDIAN RAILWAY WORKSHOP.

BY AN INDIAN CORRESPONDENT.

THE North-Western (State) Railway workshops are situated at the headquarters of the Administration at Lahore (Punjab).

This railway, owning and working nearly 5,000 miles of open line, is by far the largest in India, and also one of the largest in the world; it will, therefore, be appreciated that extensive workshops are required for the maintenance and repair of rolling-stock, &c., and for the manufacture of the numerous articles which are needed in the several departments of a large railway.

The electric drive in these workshops is of recent introduction. The necessary plant for the complete electrification of the present locomotive shops, aggregating nearly 2,000 H.P. of motors and 750 KW. of generating plant, is, however, now all delivered, and the conversion is taking place as rapidly as is possible, without interrupting the work of the shops during the change-over.

FIG. 1.—GENERAL VIEW OF ONE BAY OF THE MACHINE SHOP, WITH ELECTRICALLY-DRIVEN LATHES IN THE FOREGROUND.

The present generating plant consists of two 125-KW. and two 250-KW. sets. Three further sets, of 375 KW. each, will shortly be in work, the latter for the supply to the extensive new carriage and wagon shops (which are now being completed), to certain considerable extensions to the present loco. shops which are to be put in hand, and for miscellaneous purposes, such as pumping, supply of electricity to staff quarters, &c.

Fig. 2 shows part of the power house with the two smaller sets. The engines are of the high-speed enclosed two-crank compound type, coupled to generators by the Lancashire Dynamo and Motor Co. The switchboard, partly shown in fig. 2, is of white marble, and comprises panels for four generators, a balancer, a mid-wire panel, also provision for eight two-wire and eight three-wire feeder circuits.

The equipment of each generator panel consists of a reverse-current circuit breaker, a voltmeter plug and receptacle, a D.P. switch, an interlocked field switch, an ammeter, a watt-hour meter, and a shunt regulator with vertical pillar and hand wheel, mounted in front of the board as shown.

The feeder panels are equipped with overload circuit breakers, S.P. switches and ammeters.

Bus-bar and machine voltmeters are carried on swing brackets at the end of the board; the measuring instruments are by Messrs. Nalder Bros. & Thompson; the watt-hour meters by the B.T.-H. Co.

Messrs. Whipp & Bourne, of Rochdale, are responsible for the rest of the equipment, and also for the complete construction of the board to the designs of the electrical engineer of the railway.

The engine room is spanned by a 7-ton hand crane.

Supply is given on the three-wire system with 440 volts across the outers, to which nearly all the power load is connected. The 220-volt supply is reserved for lighting, fans, a few small motors, and some portable electric drills.

Two balancers, each capable of dealing with an out-of-balance current of 50 amperes, are installed.

Steam is supplied from four Stirling water-tube boilers, two of 4,800 and two of 9,400 lb. water per hour, normal evaporation; these all feed into a common steam main, provided with isolating valves which are normally kept closed

—the separate unit system, with each boiler feeding its respective engine, being adhered to. The boilers are, at present, hand fired, but provision has been made for the future installation of chain-grate stokers for the larger pair of boilers.

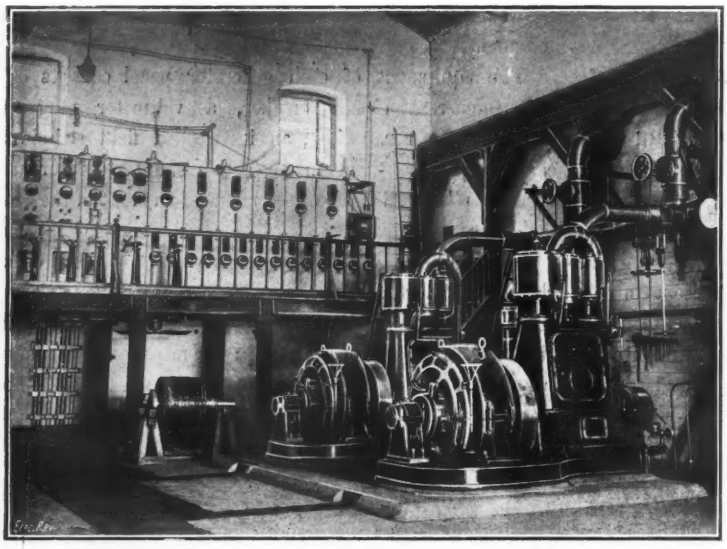


Fig. 2.—View in the Works Power House.

The main steam piping is throughout of mild steel, lagged with silicate of cotton and, in the engine room, cleaded over with planished Russian iron.

The plant is worked non-condensing, as a constant supply of circulating water is not yet obtainable, but in view of future condensing, the station is laid out with a view to the ultimate installation of such plant.

The first feature which claims attention in the locomotive workshops is a fine new erecting shop, served by four 40-ton electric travelling cranes, two in each bay. A general view

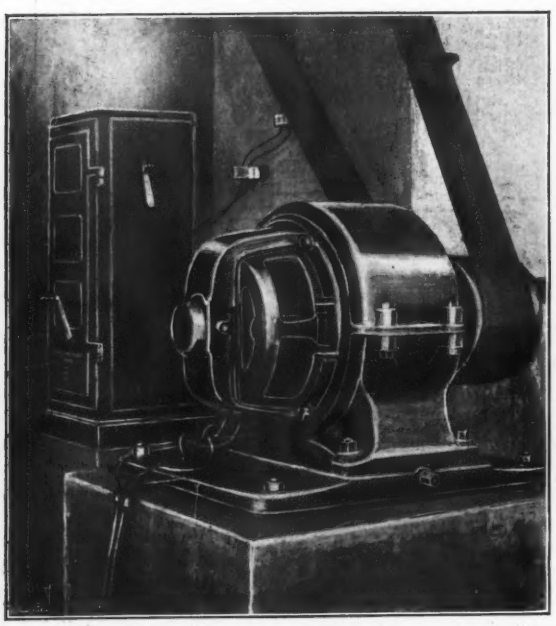


Fig. 3.—A 16-b.h.p. Line-Shaft Motor and Standard Switch Pillar.

of this shop, showing three of the above cranes, is given in fig. 5.

The cranes are capable of lifting 40 tons at 4 ft. per minute, and are provided with an auxiliary hoist lifting 5 tons at 20 ft. per minute. The speeds of travelling and traversing under full load are 170 ft. and 60 ft. per minute respectively.

The hoisting and travelling motors are of 16 b.h.p., and the traversing motors, of 7 b.h.p.; the controllers are of the ordinary tramway type with five series positions; the crane equipment was supplied by the B.T.-H. Co. It is interesting to note that though these cranes are only operated by ordinary coolies drawing the munificent wage of As. 6 (6d.) per diem., there has been no electrical failure of any sort during the 14 months they have been in use. As such labour is of the most unintelligent and careless order, this immunity from failure would seem to demonstrate, if demonstration is needed, the extreme robustness of high class electrical apparatus.

It should, however, be mentioned that the electrical engineer has established a very complete system of inspection and maintenance of all motors and other electrical plant installed in the workshops. The plant is kept in a state of thorough cleanliness and proper adjustment, more so than is generally the case in such shops, and as a result there has been no failure of any sort with any of the electrical plant installed.

In fairness to the native it should also be remarked that, although unintelligent, he has no disposition to experiment; in this he differs from the British labourer. Our "Aryan Brother" has no desire to emulate the example of an ingenious member of the former fraternity (referred to in a discussion some time ago at the I.E.E.), who, finding the operation of his controller troublesome, conceived the idea of setting it in the full running position, and starting the

Fig. 4.—Typical Main Distribution Board.

motor by the switch alone. At present the native has a wholesome fear of electricity.

The erecting shop is liberally equipped with wall sockets, from which either hand lamps or portable drilling machines can be operated.

These electric drills are much preferred by the shop staff to air drills, except for light work. On holes of $\frac{3}{4}$ in. and

upwards, which constitute the bulk of the drilling in a locomotive erecting shop, they have proved much faster than pneumatic tools. The motors are series-wound with two-speed switches mounted on the carcasses. "Stow" flexible shafts are used in place of telescopic shafts, when it is necessary to drill in confined positions. Breast drills with flexible shafts are also provided.

The primary lighting of this shop is by "Angold" enclosed-arc lamps, 80 of which are installed in the various workshops of the department. The smithies are being lighted with Cooper-Hewitt mercury-vapour lamps, which are expected to be more satisfactory than arc lamps in the very smoky atmosphere of those shops.

A considerable number of new machine tools has recently been obtained from England, and many of these have been supplied with direct-coupled motors; the total H.P. of such motors aggregates over 500.

Fig. 1 gives a general view of part of the bay in the machine shop where many of these machines are installed.

In the foreground will be observed a group of motor-driven lathes by Messrs. Dean, Smith & Grace, adapted for heavy duty, with high-speed steels. Each of the above lathes is independently driven by 5-B.H.P. and 10-B.H.P. motors of the interpolar type, for variable speed from 300-900 R.P.M.

Fig. 6 gives a separate view of one of the 18-in. face lathes. It will be observed that the motor is mounted on an extension of the lathe bed, and drives by spur gearing on to the head stock. A similar arrangement is adopted for the 10-in. lathes.

The starting and regulating gear is mounted in a self-contained pillar (clearly shown in fig. 3).

accidental contact with live metal when operating a switch, except by deliberately opening the case. To obviate this possibility, all cases are sealed, and are only opened by the electrical staff.

Fig. 7 shows a new 7-ft. heavy-duty wheel lathe driven by a 20-B.H.P. motor, interpolar type, speed 300-900 R.P.M. Eight new wheel lathes have been installed, all similar as to electrical equipment.

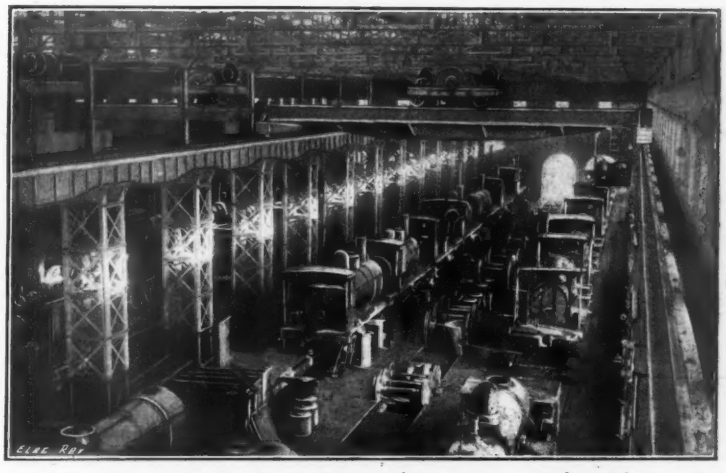


FIG. 5.—THE LOCOMOTIVE ERECTING SHOP, WITH 40-TON ELECTRIC CRANES.

Fig. 6 shows an 18-in. slotter direct driven by a 12-B.H.P. V.S. motor, also a 10 ft. × 5 ft. × 5 ft. planing machine driven by a 25-B.H.P. constant-speed motor. A smaller planer is driven by a 7½-B.H.P. motor; in these machines, which are by Messrs. J. Butler & Co., the motor is connected by Renold's chain. This form of transmission is found highly efficient and satisfactory.

Fig. 8 shows another bay of the machine shop with a 10-ton travelling crane in foreground.

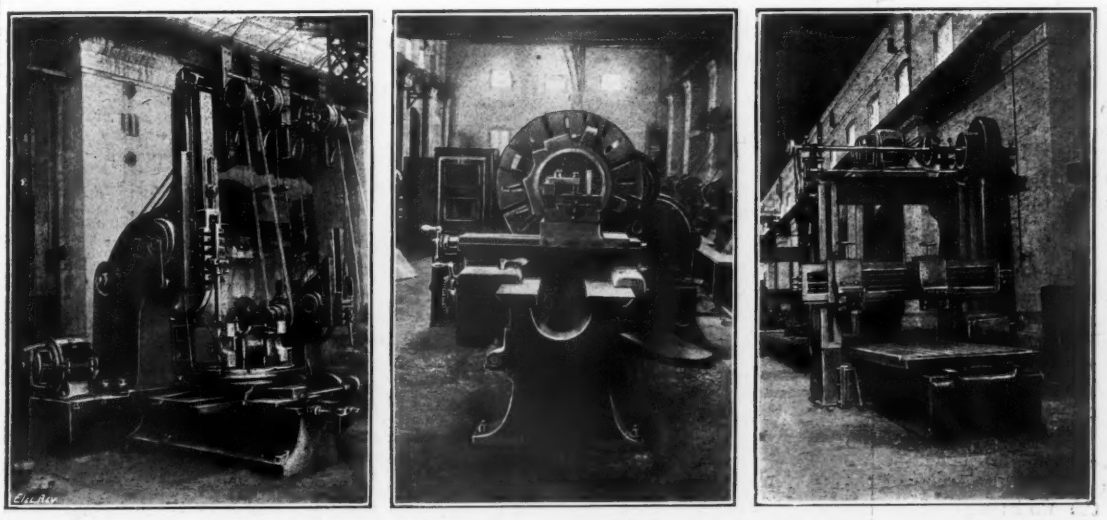


FIG. 6.—TYPICAL ELECTRICALLY-DRIVEN MACHINE TOOLS.

These panels were specially constructed by Messrs. Bray, Markham & Reiss, to the specification of the electrical engineer; they may fairly claim to be excellent examples of high-class motor starting and regulating gear. The equipment consists of a D.P. Q.B. switch, two replacement fuses, an interlocked shunt regulator, and a ratchet (slow motion) starter. The panels for constant-speed motors are similar, but with the regulator omitted. The whole is enclosed in a cast-iron and sheet-metal case, the handles of the D.P. switch, regulator and starter being external to the case. There is, therefore, no possibility of a machine man making

There are numerous other motor-driven tools, including two vertical boring mills, a double-headed pipe-facing machine (with two independent heads, each driven by a 5-B.H.P. motor) by Messrs. Geo. Richards & Co., a double-cylinder boring machine, three horizontal boring and facing machines by Messrs. Craven Bros., a 6-ft. radial drill, a large horizontal milling machine, a slab grinding machine, horizontal and vertical plate rolls, a large hydraulic pressure pump driven by a 40-B.H.P. motor, and other tools, besides several old machines which have been converted to separate motor drive.

Fig. 3 shows the standard arrangement of group drive from a 16-H.P. motor. The four standard sizes of motors employed for group driving are 25, 20 16 and 12 B.H.P. at 400, 450, 520 and 560 R.P.M. respectively. The largest and the smallest sizes are only used in special cases, the 16 and 20-B.H.P. being found the most suitable for general group driving.

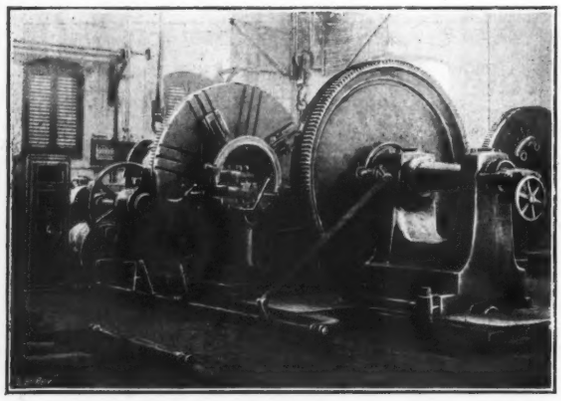


FIG. 7.—7-FT. WHEEL LATHE, WITH MOTOR AND SWITCH PILLAR.

The machine shops are served by two 10-ton and two 5-ton travelling cranes, and the boiler shop and foundry by 25-ton and 10-ton cranes.

The hoisting and travelling motors of these cranes are throughout of 12 B.H.P. at 500 R.P.M., the motors for the cross travelling motion are of 2, 3 and 4 B.H.P. according to the size of the cranes.

The speed of lifting full load is 24 ft. per minute for the 5-ton, 12 ft. for the 10 ton, and 5 ft. for the 25-ton cranes.

Travelling is effected at 300, 250 and 160 ft. per minute, respectively, under full load. The smaller cranes have the relatively fast speeds, when running light, of 350 and 400 ft. per minute.

All the controllers have seven working positions. In the case of the hoist controllers, the first three notches are parallel positions for extra slow motion. This is found very advantageous when setting work, &c. The controllers are by the Electric and Ordnance Accessories Co.

The smaller cranes have been fitted by the electrical staff of the works with a simple and efficient foot operated band-brake on the travelling shaft; some such device being essential when comparatively high speed cranes are operated by native labour. Although most crane makers do not fit brakes, except for very fast cranes, their use would seem desirable even where skilled crane men are available.

In addition to the above, three 5-ton jib cranes and two 1-ton foundry wall cranes have been supplied; all the cranes are by Messrs. Ransomes & Rapier.

All the motors, aggregating nearly 2,000 B.H.P., with the exception of those on the four 40-ton cranes previously described, are by the Lancashire Dynamo and Motor Co.

Fig. 4 shows one of the main distributing boards in the shops, and also indicates the type of wiring generally adopted. The boards provide for 20 ways; each way carries one, two, or three motors according to the horse-power. The incoming leads from power house are 37/14 cable, and pass through two circuit breakers at the top of the board.

Wiring is, as far as possible, carried on porcelain cleats which is the most satisfactory method under the local climatic conditions. Where leads have to be carried under floors, or in positions where they are exposed to injury, conduit is employed.

Association 2,500-megohm grade cable is used throughout. It may be remarked that for cable, as well as for all other electrical plant and supplies, the electrical engineer has adopted the principle that for India "the best only is good enough." Our readers will agree that this is a correct policy, in view of the very severe climatic conditions, and in view, also, of the unavoidably unintelligent handling which electrical plant in India receives, for it is certainly not in the interests of a Government Railway Administration to save a small percentage in initial cost at the expense of efficiency and reliability.

In addition to the workshops, a supply is given for power at the Lahore Press, and for other miscellaneous services, also for the lighting and ventilation of the extensive offices of the Railway Administration. Ventilation is provided generally by slow-speed roof fans, of which 90 are now connected to the mains. From April to October, fans or punkahs are a necessity of existence.

The lighting and ventilation of the railway staff quarters, some 200 houses in all, is shortly to be put in hand, also the complete lighting of the railway station and extensive goods yards.

The further plant for the new carriage and wagon shops, the extension of the loco. shops, and the above services will, it is hoped, shortly be under order. It includes three 375-KW. generating sets, and some 3,500 H.P. of motors.

FIG. 8.—ANOTHER BAY IN THE MAIN MACHINE SHOP.

The native staff is chiefly composed of Punjabi Mohammedans with a few Sikhs. Native labour is inferior as to quality, and deficient in quantity, and is daily becoming more expensive.

The electrical engineer to the railway, who has been responsible, from the beginning, for the design and carrying out of the installation, is Mr. G. E. Wright, M.I.E.E.

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CONTRACTS CLOSED.

(*Continued from page* 178.)

L.C.C.—The following contracts have been placed for the removal of sludge from the tramway conduits, depôts, &c. :—

North of the Thames.—Mr. H. Crane, at 2s. 2d. per cb. yd.
South of the Thames.—Samuel West, Ltd., at 2s. 1¢d. per cb. yd.

The Stores Committee recommends acceptance of the tender of Messrs. Crompton & Co., Ltd., for electric carbons and brushes, according to a schedule of prices.

The Stores Committee received six tenders for an electrically-driven lift at the proposed furniture stores at Quebec Wharf, Kingsland Road, as follows :—

Keighley Electrical Engineering Co. ..	(accepted)	£244
A. W. Penrose & Co.	.. ..	269
" "	(alternative)	282
Marryatt & Place	.. ..	293
R. Waygood & Co.	.. ..	310
A. Smith & Stevens	.. ..	318
A. & P. Steven	.. ..	344

Maidstone.—The order for a 500-volt battery and Entz booster for the tramways has been placed with the Chloride Electrical Storage Co., Ltd.

Plymouth.—The T.C. has accepted the tender of Messrs. Bolckow, Vaughan & Co., of Middlesbrough, for 120 tons of tram rails, at £8 per ton.

Southampton.—The T.C. has accepted the tender of Messrs. Walter Scott, Ltd., for 100 tons of rails and 15 tons of 7-in. curve rails, at £7 10s. per ton.

Wrexham.—The Education Committee has accepted the tender of Messrs. F. J. Jones & Son, of Chester, for wiring schools, at £289.

CONTRACTORS' COLUMN.

[The following information is published in the interests of electrical contractors and others who are seeking for openings for new business. Considerable expense is incurred in the production of this column, and every care is taken to ensure that the information is new and accurate, but it will be understood that in a matter where so many correspondents are engaged, and where the amount of information to be handled is very large, this cannot always be guaranteed. If alleged inaccuracies are reported to the Editors, they will be fully investigated.]

ALVECHURCH (near BIRMINGHAM).—Proposed new Church at Barnt Green Mr. Dixon, architect, Birmingham.

AXMINSTER.—New Town Hall (£1,200). Town Hall Co., Axminster.

BARNBY MOOR (near RETFORD).—Hunt kennels and block of stables (to be lit by electricity), for Earl Fitzwilliam. G. A. Wilson, architect.

BARNES.—Additions to Leinster House, St. Leonard's Road, for C. Ellis and Co.; five shops, Sheen Lane, for W. Connock.

BARNSLEY.—Semi-detached villas, Gawber Road. W. T. Turner, architect, Market Hill, Barnsley.

BATLEY CARR (near DEWSBURY).—Warehouse, stabling, &c., at Wheatcroft Mills. Barton & Son, architects, Halifax Road, Dewsbury.

BEBINGTON (near BIRKENHEAD).—Alterations to Richmond Hill (residence). J. E. Tate, architect, 9, High Street, Wrexham; J. Lee & Sons, builders, Bebington.

BELFAST.—Factory, College Street, for M'Arthur & Co. (£3,000). J. R. Thompson, Ltd., contractors.

BELPER.—Alteration of Over Lane Church.

BEVERLEY.—Additions to County Hall (£225). Architect, County Council, Beverley.

BILLINGE (near WIGAN).—Waterworks extensions. Surveyor, Council Offices, Billinge.

BINGLEY (YORKS.)—Probable re-erection (after fire) of premises, Clyde Street, for W. R. Dawson & Co., yarn, warp, and waste dealers; villa residence, Glen Road, Eldwick, for J. F. Harvey.

BIRKENHEAD.—Workshop. Grayson & Ould, architects, Pacific Buildings, 31, James Street, Liverpool.

BIRMINGHAM.—New school in Charles Arthur Street, Nechells. Architect' Education Department, Edmund Street, Birmingham.

BLACKPOOL.—Hydropathic establishment. W. A. Thomas, architect, 14, Dale Street, Liverpool.

BLAINA (MON.).—Mixed and infants' school for 510 children. C. Dauncey, secretary, Education Committee, Newport.

BLYTHE.—Proposed new municipal offices and conversion of council chambers into fire station.

BODMOUNT. — Hall; Grayson & Ould, architects, Pacific Buildings, 31, James Street, Liverpool.

BOTHWELL.—Donald Institute (£1,600). A. Cullen, Lochhead & Brown, architects, Hamilton.

BRENTWOOD (ESSEX).—Sewerage works for the U.D.C. (£20,000).

BRIDGEND.—Two shops and dwelling-house at Kenfig Hill, for Thos. Nicholas, Victoria Buildings, Port Talbot. A. T. James, architect, 25, Station Road, Port Talbot.

BRISTOL.—New engine shed and other works at St. Philip's Marsh, for the Great Western Railway. G. K. Mills, secretary to the G.W.R., Paddington Station, W.

BROMLEY.—Alterations to St. Mary's Parish Room, Shortlands; F. W. Green. Business premises, High Street; W. Willett, Sloane Square, Chelsea, S.W. Alterations, Log's Hill, Elmstead Lane; G. Coulter, builder, 43, Mason's Hill, Bromley.

BRYNMAWR (MON.).—Old Castle Inn to be rebuilt for A. Buchan & Co., Rhymney Brewery; T. Roderick, architect, Clifton Street, Aberdare.

BUCKHAVEN (FIFE).—New houses and shops in Buckhaven and Methil.

BUILTH WELLS (BRECONSHIRE).—Proposed pavilion (to accommodate 4,000); G. Vaughan, president of the Committee.

BURNHAM (SOMERSET).—Extensions to the Gables for G. S. Lysaght. Sansom and Cottam, architects, Bridgwater; W. J. Pople, builder Burnham.

BURNLEY.—Proposed skating rink by Factors, Ltd., Burnley.

BURTON-ON-TRENT.—Prospective restoration of buildings, after fire, to Bindley & Co., Ltd., brewers.

BURY.—Reinstatement of premises, after fire, for W. Crompton, wholesale druggist, Bolton Street.

CARSHALTON.—Houses, Carshalton Park Road, for the Carshalton Development Co.; The Beeches, for G. R. Burrage.

CASTLETON.—Proposed mission church in connection with Castlemere church.

CHIPPERFIELD (HERTS).—New manse. Trustees, Baptist Church, Chipper field.

CHISLEHURST.—New college for Girls' College Association on Sudbury Estate. Sir G. H. Chubb, chairman.

CLECKHEATON.—Secondary school, Whitcliffe.

COALVILLE.—New secondary schools (£7,250). Barrowcliff & Alcock, architects, Town Hall Chambers, Loughborough.

DARTFORD.—New factory for the Acme Bottle Manufacturing Co.

DONCASTER.—Alterations to the Prince of Wales Hotel, Baxter Gate; H. Beck, architect, Dolphin Chambers, Doncaster. New Primitive Methodist Sunday School (£1,700); Trustees.

DUDLEY.—Alterations and extensions at the Union Offices, St. James Road E. G. Coslett, architect, Wolverhampton Road, Dudley.

DUNDEE.—Warehouse in Lindsay Street, for John Henderson & Sons; alterations on premises, for Robert White, Nethergate; additions to foundry, for Miss H. Scott, Soapwork Lane.

DUNFERMLINE.—New model lodging house, for R. McDonald, Chape Street; new high school and offices (£5,000 or £6,000).

DUNSTABLE.—Wesleyan Institute. Wood & Son, builders, Dunstable.

DURHAM COUNTY.—New schools at North and New Brancepeth, for the C.C.; F. E. Coates, architect, Shire Hall, Durham. New schools at Medomsley Edge; J. J. Eltringham, architect, Blackhill.

EASTBOURNE.—Pavilion at the bowling green. Borough surveyor, Town Hall.

EAST KIRBY.—New schools (£2,500).

EASTLEIGH (HANTS.).—Proposed new Council school at Derby Road (£10,894). W. J. Taylor, county surveyor, Winchester.

EDINBURGH.—Concert hall. Walker & Ramsey, architects, 123, Wellington Street, Glasgow.

EPSOM.—Workshops at Epsom College.

ERITH.—Laundry and disinfector at the Sanatorium, and additions to tramway workshops, for the U.D.C. (£792); G. H. Gunning, builder, South Road, Erith.

EXETER.—Probable rebuilding, after fire, of mill, for the West of England Trading Co.

FLEETWOOD.—Extensive ice factory (£40,000).

FOLESHILL (near COVENTRY).—Extensive additions to factory premises for Samuel Courtauld, Ltd., crape manufacturers, Aldermanbury, London.

FOLKESTONE.—New wards and extension of out-patients' department at the Victoria Hospital; H. J. Moody, architect, 10, Quested Villas, Surrenden Road, Folkestone.

FORESTFACH (SWANSEA).—New shops, bakery and stables for the Cwmbwrla Co-operative Stores. C. S. Thomas, Meager & Jones, architects 16, Wind Street, Swansea.

GLASGOW.—Masonic Halls in Bridgeton for Lodge Union and Crown; the secretary. Additions to waste factory for J. Paxton, 45, Ladywell Street.

GREAT CROSBY (near LIVERPOOL).—Houses, Maridon Avenue, for A. Nugent; Bridge Road, for T. E. Watson; Cook's Lane, for J. Johnson Abbotsford Road, for Miss Brumwell; Mersey Road, for T. Banner. Motor garage, Coronation Road, for Garside & Co.

HARROGATE.—Conversion of 10, Park Parade, into flats; J. Lomas-Walker, Westminster Chambers, Harrogate. Houses, Rutland Road, for D. Simpson, builder; Western Terrace, for Wm. Walker; additions to Woodlands, Beech Grove, for R. C. Willey, 1, Granby Road; shop and warehouse, Dragon Road, for J. Shepherd.

HELSBY (CHESHIRE).—Elementary school. Jos. Holt, architect, 9, Albert Square, Manchester.

HEREFORD.—Important alterations to business premises, for Hogben Bros., drapers, 58, Broad Street; extension and rebuilding o premises, for Greenlands, Ltd., house furnishers, High Town.

HERNE BAY.—House, Reculver Road, for J. Young; E. T. J. Adams, builder, Market Street. Shop and additions to 95, Mortimer Street, for C. Dennett, fishmonger.

HIGH WYCOMBE.—Two houses and workshops, Leigh Street, for W. Abbott.

HONLEY (YORKS.).—Alterations to shop premises, for the Co-operative Society; J. Berry, architect, 3, Market Place, Huddersfield.

HORLEY (SURREY).—Villa residence, Avenue Garden, for A. P. Pickton, Montpelier Street, Brompton Road, London, S.W.

INVERKEITHING.—Four houses, for Thos S. Milne, Aberdour. Houses for workmen at Rosyth Naval base; Tilbury Dredging and Contracting Co.

LEEDS.—New drill hall, for 8th Battalion of the Leeds Rifles.

LEICESTER.—Baths for the T.C. (£8,000). A. H. Hind, architect, Grey Friars, Leicester.

LEIGH-ON-SEA.—Proposed Council Offices, Fire Brigade Station, &c., for the U.D.C. (£5,000).

LEVEN (FIFE).—New premises for East Fife Laundry Co. at Leven.

LITTLEBOROUGH.—Extensions to parish schools (£1,000). Rev. Dr. Salts vicar.

LIVERPOOL.—Schools, Gladys Street; W. Sprout, architect, 18, Cook Street, Liverpool. Dairy premises, W. Hulme, Liverpool; cold storage warehouses, Deacon & Horsburgh, 81, George Square, Liverpool. School; Bradbury & Son, architects, Cook Street, Liverpool; W. Hull & Son, builders, Liverpool.

LLANFRECHFA (near NEWPORT, MON.).—New business premises, Chapel Street, for the Cwmbran and Pontnewydd Co-operative Society.

LONDON (WESTMINSTER, S.W.).—Alterations to 11, West Street; Tyars and Jago, architects, 10, John Street, Adelphi. Addition to 86, Vincent Square, for Miss B. Nicholson; addition to St. Matthew's Mission Hall, St. Anne's Lane, H. S. Rogers.

(ISLINGTON, N.).—Enlargement of Queen's Head Road School. T. J. Bailey, education architect, L.C.C. Offices, Victoria Embankment, E.C.

(KENNINGTON, S.E.).—Additions to premises Camberwell New Road for the General Motor Cab Co., Ltd.

(HACKNEY, N.E.).—Rebuilding warehouse, Hackney Grove. C Castle & Son, builders, Milton Works, Shacklewell Lane, N.E.

(WESTBOURNE GROVE).—Premises for Messrs. Bradbury. E. J. Stubbs, architect, Craven Street, W.C.; Wallis & Son, builders, Maidstone, Kent.

(ISLINGTON, N.).—Alterations to Nos. 371-373, Holloway Road, for the Capital & Labour Clothing Association. Building in Upper Street; Jo. S. Wild.

LONDON (MARYLEBONE, W.).—Additions to Stratford House, Stratford Lane; Romaine-Walker & Besant, architects, 6, Old Bond Street, W. Building in Barrett Street and Duke Street, for Krohne and Sesemann. Alterations to 38 and 40, Langham Street; F. W. Foster, architect, 41, Bedford Road, W.C.

(W.).—Restoration of premises, after fire, for the Furriers Alliance, Bond Street; prospective restoration, after fire, of premises in Lisle Street, Leicester Square, for F. Kleine, bootmaker.

(E.C.).—Alterations to Nos. 44, 45 and 45A, Jewin Street; Perry Bros., Ltd., builders, 11, Finsbury Square, E.C. Alterations to 29-30, Trinity Square; Chambers, Giet & Ford, surveyors, 12, Trinity Square.

(STOKE NEWINGTON, N.).—Additions to factory, Kersley Road. A. W. Hudson, architect, 87, Finsbury Pavement, E.C.

(ACTON, W.).—Rebuilding "Six Bells" public house, for Isleworth Brewery Co.

(EDMONTON, N.).—Prospective restoration, after fire, of Ridley, Whitley & Co.'s linoleum factory.

(WALTHAMSTOW, N.E.).—Three houses, Beech Hall Road. O. H. Watling, builder, 1, Handsworth Road, Walthamstow.

(HAMMERSMITH, W.).—Small concert hall, Architect, care of Horncastle's, Cheapside, E.C. Additions to meeting hall for Baptist Chapel, King Street (£1,015); G. Wilson & Co., architects, 667, Fulham Road, S.W.; W. Lowe, builder, 190, Castlenau, Barnes. Motor garage in Paddenswick Road; J. H. Richardson, architect, 22, King Street, Hammersmith, W.

(WANDSWORTH, S.W.).—Mortuary and Coroner's Court adjoining Earlsfield Station, Borough Surveyor, Wandsworth; shops in Rostella Road and Thurso Street, F. G. B. Crawley.

(TOOTING, S.W.).—One hundred and twelve cottages on Totterdown Estate, for the L.C.C. (£23,190). Rowley Bros., contractors, Tottenham, N.

(ST. PANCRAS, N.W.).—School in Harmood Street, E. Lawrence and Sons, contractors, Wharf Road, City Road, E.C.; four blocks of working-class dwellings in Hastings Street and Tonbridge Street, A. Davis.

(MANOR PARK, E.).—New Catholic schools, junction of Church Road and Little Ilford Lane.

(HIGHBURY VALE, N.).—Police Station. J. Dixon Butler, surveyor to Metropolitan Police, New Scotland Yard, S.W.

(W.C.).—Extension of factory, for Leveson & Sons, perambulator makers, 90 and 92, New Oxford Street, W.C.; alterations to the Shaftesbury Theatre (including new electric lighting system), F. A. Tugwell. Alterations to Nos. 57 and 58, Lincoln's Inn Fields, for Marks & Clerk. Buildings in St. James' Street and Little St. James' Street; W. Woodward & Sons.

(SOUTHFIELDS, S.W.).—Mess room, &c., at the Castle Laundry, Frogmore; A. P. Killick, architect, 72, King Street, Hammersmith.

(GREENWICH, S.E.).—Additions to Delta Works, Tunnel Avenue, for Delta Metal Co., Ltd., East Greenwich.

(PADDINGTON, W.).—Alterations to the Workhouse, 5, Woodfield Road, Harrow Road. E. H. Sim, architect, Mowbray House, 14, Norfolk Street, Strand, W.C.

(NEW CROSS, S.E.).—Offices, Cold Blow Lane; J. W. Jerram, builder, Boundary Road, East Ham. Hall, Besson Street; J. H. Waterworth, architect, 385, Queen's Road, S.E.

(HORNSEY, N.).—Alterations to Eagle Works, High Street; Holliday and Greenwood, builders, Loughborough Park, Brixton, S.W.

(POPLAR).—Buildings in Glengall Road and Mellish Street; J. & W. Clarkson, architect, 136, High Street, Poplar, E.

(BRIXTON).—Building on site of Nos. 98-104, Shakespeare Road, for Osborne & Young, Ltd.

(DEPTFORD, S.E.).—Additions to 71, High Street. H. L. Holloway, builder, Union Works, Deptford.

(HATCHAM, S.E.).—Additions to factory, Rollins Street. Perry Bros., Ltd., builders, 11, Finsbury Square, E.C.

(STRATFORD, E.).—Slaughter-house at Mr. G. Streeton's premises Barber's Road.

(WEST HAM, E.).—Offices and extension of store shed at Corporation Electricity Department, Romford Road. A. H. Seabrook, electrical engineer.

(SOUTHWARK, S.E.).—Building in Dantzic Street and St. George's Market; W. F. Hurndall. Building in Dantzic, Earl and Providence Streets, for R. Hoe & Co.

(HAMPSTEAD, N.W.).—Alterations and additions to No. 577, Finchley Road, for Dr. Mabel Hardie.

(BERMONDSEY, S.E.).—Building in Tower Bridge Road and Tanner Street, for the City of London Brewery Co., Ltd.

(ROTHERHITHE, S.E.).—Buildings in Cow Lane. J. J. Freeland.

(DULWICH, S.E.).—Building, 147, Half Moon Lane. V. Vagnolini.

(CLAPHAM, S.W.).—Church in Culmstock Road, for Canon J. E. Clarke. J. S. Quilter & Son.

LONG EATON.—Proposed gas works extensions. Secretary, Gas Co., Long Eaton.

LYTHAM.—Church Institute (£5,000). G. H. Willoughby, architect, 3, York Street, Manchester.

MARTOCK.—New butter factory for Messrs. Paull. Mr. Fish, Martock.

MASBRO' (near ROTHERHAM).—School for the Managers of St. Bede's. J. Platts, architect, High Street, Rotherham.

MERTHYR TYDFIL.—Sixty-eight houses at Penywern, Dowlais. Borough surveyor, Town Hall, Merthyr Tydfil.

MILNSBRIDGE (YORKS.).—Twelve houses, Bowling Street and Casson Street; Lunn & Kaye, architects, Milnsbridge and Huddersfield. Two houses, Cowlersley Lane; J. Ainley, architect, Chapel Street, Slaithwaite.

MITCHAM.—New depôt, Homewood Road (£767). J. S. Killick, surveyor to Croydon U.D.C.

MONIFIETH.—Villas in Hill Street; Mr. Alex. Ramsay, builder, Monifieth. Proposed new Municipal Buildings; Burgh Surveyor, Monifieth.

NELSON.—Proposed extension, Bradshaw Street School. Secretary, Local Education Committee.

NEWBURY.—Girls' school, for Berkshire Education Committee (£8,930). J. B. Steward, builder, Wokingham.

NEWPORT (I.W.).—School. P. Stone, architect, 33a, Holyrood Street, Newport, I.O.W.

NORTHFLEET.—Twenty-seven houses, Napier Road. Luckett & Crittenden, builders.

NORTH SHIELDS.—Probable re-erection (after fire) of works (electrically equipped) for the British Case Making Co. A. Nicholls, Whitley Bay, managing director.

NOTTINGHAM.—Important additions to the Midland Institution for the Blind, Chaucer Street.

Proposed additions to the Mechanics' Institution (£5,000).

OGMORE VALE (BRIDGEND).—Hall (seat 1,000), smaller hall, billiard room and Institute. W. B. Rees, architect, 3, Dumfries Place, Cardiff.

OLDHAM.—Tramway depôt buildings; E. C. Foote, borough surveyor, Town Hall, Oldham. Probable extension; Glebe Mills Co., Ltd.

OSWALDTWISTLE.—Conversion of residence into training college for Roman Catholic students.

PENDEEN (CORNWALL).—New Council school. G. Miners, builder, Marazion.

PONTYPRIDD.—New Y.M.C.A. building. Vernon Hodge, architect, London.

POOLE.—Proposed new casual ward at the workhouse.

PORTADOWN (IRELAND).—Public baths. Hill & Kennedy, architects, Portadown.

PORTOBELLO (N.B.).—Municipal buildings (£2,500). J. Williamson, Public Works Office, Edinburgh.

PRESTON.—New skating rink, for W. H. Broadhead & Son, Blackpool.

RADLETT.—County Council school. A. R. S. Halliday, secretary, Herts Education Committee.

RICHMOND-ON-THAMES.—Ten houses, Burlington Avenue, for Edwin Evans; rebuilding Beehive, Lower Richmond Road, for Watney, Combe, Reid & Co., brewers, Stag Brewery, Pimlico.

ROTHERHAM.—Additions and alterations to wagon works, Holmes, for Harrison & Camm.

RUSHDEN.—Co-operative factory. F. Harris, Balloon Street, architect, Manchester.

ST. ALBANS.—Proposed adaptation of Public Library for Higher Education purposes (£21,080). County Surveyor, Shire Hall, Hertford.

ST. ANNES-ON-SEA.—Extension of Pier Pavilion; new church house for St. Andrew's at corner of Oxford Road.

ST. HELEN'S (ISLE OF WIGHT).—Four villas, Priory Bay, for D. Caws, St. Leonard's, Sea View; additions to Sea View Hotel.

SANDBACH (CHESHIRE).—New Council school. County Education Committee, Chester.

SHINFIELD.—Building for Berkshire Education Committee (£3,480). C. Aldridge, builder, Spencer's Wood.

SKELMANTHORPE (YORKS.).—New Liberal Club premises (£1,000).

SLOUGH.—Houses, Uxbridge Road, for H. D. Bowyer, builder, Mackenzie Street; Arthur Road, for R. Cozens; Alexandra Crescent, for E. Griffin.

SMETHWICK.—Warehouse in Grove Street, for the Patent Butted Tube Co.

SOUTHAMPTON.—Extension of municipal lodging house, St. Michael's Square (£3,300).

SOUTH SHIELDS.—Extension of No. 78, Cuthbert Street, for A. Wood; J. J. Dockwray, architect, 163, Hyde Street, South Shields. Motor garage, &c., Imeary Street, for J. Teasdale; P. G. Lawson, Cleadon Hall, Sunderland. Additions to baths and washhouses; J. Morton, architect, King Street, South Shields.

STAINES.—Building at Shooting Park; Cogswell & Harrison, 226, Strand, W.C. Rebuilding "The Bell," Bedfont, for Newell, Parr and Kates.

STAPLE HILL (BRISTOL).—School. R. S. Phillips, architect, The Cross, Gloucester.

STOCKPORT.—New Central Library (£18,000). Borough surveyor.

STONEHAVEN.—Alterations on buildings at Mill of Catterline. Davidson and Garden, 12, Dee Street, Aberdeen.

SUDBURY.—Stores for Walker & Co. (£1,463); G. Greenwood & Sons, builders, Sudbury.

SUNDERLAND.—Branch Library, Kayll Road; H. Hedley, architect, Sunniside Chambers, Sunderland. Branch Library, Church Street North; E. Cratney, architect, 35, High Street East, Wallsend.

SUTTON (NOTTS.).—Police Station. E. P. Hooley, architect, Shire Hall, Nottingham.

SUTTON (SURREY).—Two shops, Grove Road. P. V. Windebank & Co., builders, Hillcroome Road, Sutton.

SWANSEA.—Conversion of Chapel, Castle Street, to lock-up shops for the Liverpool China and India Tea Co.; additions to Grosvenor Hotel, College Street.

TAUNTON.—Extension of Free Library (£1,500). D. Edwards, architect.

THORNABY-ON-TEES.—Eight houses, St. Paul's Road, for J. W. McLeod; 14 houses, St. Paul's Road, for Sidgwick Bros.

THURSO.—Hall at Lyth and alterations and additions to Church Manse at Dunnet. S. Macdonald, architect, Thurso.

TORQUAY.—Additions to Redcliffe House, St. Marychurch. Salter & Son, builders, Sheffield House, St. Marychurch.

TREDEGAR.—New Church at Dukestown. A. F. Webb, architect, Blackwood.

TREORKY (near PONTYPRIDD).—Extensive additions to Noddfa Church. J. Rees, architect, Pentre.

UPTON-ON-SEVERN.—Alterations and additions to Hanley Castle Grammar School. A. B. Rowe, architect, 30, Foregate Street, Worcester.

WAKEFIELD.—House, Denby Dale Road, Durkar, and detached villa residence, Bradford Road; W. Wrigley, architect, 2, King Street, Wakefield.

WALDRIDGE.—School (£3,000). W. Rushworth, architect, Shire Hall, Durham.

WALKDEN.—The notice under Worsley in last week's issue, *re* sewage scheme, should have been under Walkden.

WALLASEY.—Refuse destructor buildings for U.D.C.; W. H. Travers, engineer and surveyor to the Council, Egremont, Cheshire. Church; W. S. Ellison, architect, 22, Sir Thomas Street, Liverpool.

WALLINGTON (SURREY).—Two houses, Taylor Road. H. S. Lee, "The Cottage," Grosvenor Road, Wallington.

WALSALL.—Underground conveniences, The Bridge, for the T.C. (£1,500).

WALSINGHAM.—Sunday school (£10,000). W. Rushworth, architect, Shire Hall, Durham.

WARE.—New premises and alterations at Easneys; Chas. R. Price, builder, Bishopsgate Street, London, E.C. Additions to works, Millside, for Allen & Hanbury, Ltd., manufacturing chemists.

WATERLOO (near LIVERPOOL).—Houses, corner of Milton and Stuart Roads, for Jas. Houghton; Tottington Road, for O. E. Roberts; College Road, for C. & W. E. Brooks; Oxford Road, for the trustees of the late R. M. Foster.

WELLINGTON.—New baths in Walker Street for Urban Council; new buildings in New Street, Shrewsbury Road and Bridge Street.

WELLS.—Extensions to the asylum, for the Somerset and Bath Asylums Committee (£17,000).

WHITEFIELD (LANCS.).—Grammar school. H. Littler, architect, 16, Ribblesdale Place, Preston.

WIGAN.—Extensive alterations to business premises, for Pendlebury & Co., Ltd., house furnishers, Crawford House.

WISHAW.—Sawmill, for Graham, Ltd., at Whitegates; two tenement houses, Meadowhead Road, by A. Wilson, Motherwell.

WOKING.—Proposed church house, Union Road.

Will.—The estate of the late Mr. Joseph Beardmore, a director of W. Beardmore & Co., Ltd., of Glasgow, is valued at £19,328.

FORTHCOMING EVENTS.

Society of Engineers.—Monday, February 1st. At 7.30 p.m. At the Royal United Service Institution. Presidential address by Mr. E. J. Silcock.

Royal Society of Arts.—Monday, February 1st. At 8 p.m. Cantor lecture on "The Public Supply of Electric Power in the United Kingdom," by Mr. G. L. Addenbrooke. (Lecture III.)

Institution of Electrical Engineers (Newcastle Section).—Monday, February 1st. At 8 p.m. At the Armstrong College, Newcastle-on-Tyne. Paper on "The Electric-Hydraulic Plant at the Bristol Dock," by Mr. W. A. Clatworthy.

Institution of Civil Engineers.—Tuesday, February 2nd. At 8 p.m. Paper "On Heat-Flow and Temperature-Distribution in the Gas-Engine," by Prof. Bertram Hopkinson.

Electro-Harmonic Society.—Tuesday, February 2nd. King's Hall, Holborn Restaurant. Concert. (Ladies' Night.)

Institution of Electrical Engineers (Manchester Students' Section).—Tuesday, February 2nd. At 7.30 p.m. At the Municipal School of Technology. Paper on "Automatic Devices for Tramway Working," by Messrs. J. G. and R. G. Cunliffe.

Institution of Electrical Engineers (London Students).—Wednesday, February 3rd. At 7.45 p.m. In the Library of the Institution. Paper on "The Direct-Current Variable-Speed Motor and its Application to Modern Machine Tools," by Mr. W. S. Lonsdale.

Rontgen Society.—Thursday, February 4th. At 8.15 p.m. At 20, Hanover Square, W. Discussion on "The Transportation of Ions," to be opened by Dr. H. Pirie.

Institution of Electrical Engineers (Glasgow Section).—Saturday, February 6th. At 7.30 p.m. At the Grosvenor, Glasgow. Annual smoking concert.

Institution of Electrical Engineers (Manchester Section).—Tuesday, February 9th. At 7.30 p.m. At the University, Manchester. Paper on "An Elementary Treatment of Some Alternating-Current Problems," by Dr. W. G. Rhodes.

THE ELECTRICAL ENGINEERS
(LONDON DIVISION).

The following orders are issued:—

Commanding Officer—COL. R. E. B. CROMPTON, C.B.

Monday, February 1st.—"A" Company. Infantry drill (recruits), 6 to 7 p.m. Lecture by Capt. Phillips. Technical drill, 7 to 10 p.m.

Tuesday, February 2nd.—"B" Company. Infantry drill (recruits), 7 to 7.45 p.m. Lecture by Capt. Phillips. Technical drill, 7 to 9.30 p.m.

Tuesday, February 2nd.—Medical inspection for recruits, 6.30 to 7.30 p.m.

Thursday, February 4th.—"C" Company. Infantry drill (recruits), 6 to 7 p.m. Lecture by Capt. Phillips. Technical drill, 7 to 10 p.m.

Friday, February 5th.—"D" Company. Infantry drill (recruits), 6 to 7 p.m. Lecture by Capt. Phillips. Technical drill, 7.15 to 9.30 p.m.

Saturday, February 6th.—"B" Company. Week-end run at Coalhouse Fort. Parade at Fenchurch Street Station, 3.10 p.m. Service dress. Greatcoats will be worn, and haversack over right shoulder. Arms must be taken.

(Signed) J. H. S. PHILLIPS,
Capt. and Acting Adjutant.

NOTES.

Electrical Trades Benevolent Fund. — The dinner which is being arranged in connection with the above Fund is to take place on Friday, March 19th, at the Whitehall Rooms of the Hotel Metropôle. This engagement should be entered in your diary straightaway.

Legal.—THE CORPORATION OF LIMERICK *v.* CROMPTON AND CO., LTD.—On January 13th, in the Dublin King's Bench Courts, Mr. Gerald FitzGibbon, K.C., and Mr. Poole applied on behalf of the defendants, Messrs. Crompton & Co., Ltd., electrical engineers, for an order that an order of this Court of November 17th last be discharged (which gave leave to the plaintiffs to proceed with the action in Ireland), and the writ of summons be set aside, on the ground that it was a term of the contract for the breach of which damages are claimed that the claim should be enforceable in England out of the jurisdiction of this Court, and not elsewhere; that the defendants are domiciled and ordinarily resident in England, and that any action in respect of such breaches can, if allowed to proceed, be more properly, conveniently and cheaply tried in England, or, in the alternative, that proceedings be stayed under Sec. 14 of the Common Law Procedure Amendment Act, 1856. The action was brought for the recovery of damages or delay by the defendants in executing a contract alleged to be for the electric lighting of the City of Limerick, dated October 11th, 1907, made between the plaintiffs and the defendants, and for damages for the alleged breach thereof.

According to the report in the *Freeman's Journal*, Mr. Charles Doyle, K.C., who appeared for the plaintiffs, the Limerick Corporation, said that the contract was for about £1,300, and the Corporation, for one item, complained that the defendants, though contracting to supply a 250-H.P. engine, had only supplied a 240-H.P. engine. This was one of the breaches the plaintiffs relied on, besides the delays in the erection of the works. He contended that the special clauses in the contract requiring disputes to be decided according to English law did not preclude proceedings in Ireland. Counsel cited several cases in support of his contention, and he submitted that the order of November 17th should stand.

The Court unanimously discharged the order impugned, deciding that on the 48th clause of the contract it was in all respects to be construed and dealt with as an English contract, and to operate as an English contract in all respects, extending the proceedings to England, and excluding them from the Irish jurisdiction, and that the writ of summons be set aside, costs to be allowed to the defendants.

An Equitable Specification.—Our criticisms of consulting engineers' specifications have hitherto, unfortunately, been in the main unfavourable, owing to the tendency so frequently manifested on the part of the framer of "general conditions"—whether he be lawyer or engineer—to treat the contractor as a person who has no rights, and to elevate himself upon a pedestal as the embodiment of justice and omniscience (by virtue of a saving clause) in the event of any dispute arising between himself and the malefactor (so-called contractor) who presumes to question his decrees. It is with pleasure, therefore, that we draw attention to a specification recently issued by Messrs. May & Hawes, in connection with the new electricity works for the Fareham U.D.C. We have carefully examined the general conditions attached to the specification, and find no clause which can be stigmatised as tyrannical or unfair. Arbitration is expressly provided for in the event of any dispute or difference arising between the purchasers or their engineers and the contractor in connection with the contract, at the instance of either party, and the award of the arbitrator is made final and binding on the parties, the costs being determined by the arbitrator, and allocated by him. The clause, in fact, is based upon that contained in the model general conditions drawn up by the Institution of Electrical Engineers in 1901. We note with pleasure, too, the absence of clauses specifying that the work shall be in every respect complete and perfect, in spite of possible omissions from the specification or errors in the engineer's drawings. Such clauses carry on their face the fear of incurring responsibility, the confession of ignorance or doubt as to one's own competence to draw up an adequate specification. Their inclusion ought to stamp their author as unfit for his profession. Messrs. May & Hawes are also to be congratulated upon the simplicity and clearness of their specification, which, by the way, calls for Diesel engines coupled to alternators, and is, therefore, somewhat out of the common.

Standing Order Proofs.—On 21st inst. proofs of compliance with Standing Orders were given to the Examiners by the agents of the following Bills: North-West London Railway; Greenock Corporation; Edgware and Hampstead Railway; Watford and Edgware Railway; Ravenglass and Eskdale Railway, and the North-East London Railway. There was no appearance in the case of the Biddulph Gas Bill, which contained provisions, amongst other things, to enable the company to apply for powers under the Electric Lighting Acts.

On Monday, the Examiner found that Standing Orders had been complied with in the case of the 14 Scotch Provisional Order Bills being promoted. The only order of interest from the electrical point of view is that of the Glasgow Corporation, which provides for an expenditure of £53,872 on tramways.

Football.—The result of the match played at Peckham Rye on the 14th inst. between the L.C.C. Sub-stations F.C. (Southern Division) and the Peckham and Dulwich Rovers was as follows:—L.C.C., 4; Peckham, 0.

A match was also played on Wednesday last week, at Finsbury Park, with the St. James's United, Piccadilly, the result being L.C.C., 3; St. James's, 2. The kick-off was at 3.15 p.m., and there were about 200 spectators present. This makes the seventh match in succession won by the L.C.C. Club.

ELECTRICAL FOOTBALL LEAGUE. — The following matches are down for decision to-morrow (Saturday), the kick-off in each case being 2.45 p.m.:—St. James's Electric *v.* St. Pancras Electric, at Wormholt Farm; Robertson's Lamps *v.* Ediswan, at Gunnersbury Avenue, Ealing.

Smoke Abatement.—We have received a copy of full rules and information issued for the benefit of intending exhibitors at the Smoke Abatement Exhibition which is to be held at Sheffield from March 1st to 20th. It is being promoted by the Sheffield Federated Health Association, and will be held at the Corn Exchange. Copies of the circular can be obtained from Mr. W. Bashforth, 45, Bank Street, Sheffield, the secretary. A reference to the matter appears in our advertisement pages to-day.

Electro-Harmonic Society.—Members are reminded that the next concert (Ladies' Night) is to take place on Tuesday, February 2nd—a sufficiently important departure from the usual practice of holding the concerts on Friday evenings to justify our suggesting that our readers should make a special note of the alteration. The programme includes selections from Mendelssohn's "Midsummer Night's Dream" by the orchestra, vocal solos by Miss Ada Forrest, Miss Maria Yelland and Mr. Braxton Smith; recitations by Mr. Alexander Watson; imitations of actors by Mr. Lewis Benet; humorous songs by Mr. Fred Rome, and humorous sketches by Mr. Selwyn Driver.

Institution and Lecture Notes.—INSTITUTION OF CIVIL ENGINEERS. — The Council has awarded the "Indian premium" of the Institution for 1908, of the value of £33, to Mr. F. P. Anderson, M.Inst.C.E., for his paper on "River Control by Wire Network."

INSTITUTION OF CIVIL ENGINEERS (STUDENTS).—On Friday last Messrs. W. E. Fisher and E. B. Wood, B.A., presented a full and interesting account of their "Experiments on a Diesel Engine," carried out at Birmingham University. The authors interpreted the results of the tests to indicate that the efficiency of the engine depended chiefly upon the form of spray or fuel-pulveriser used, rather than upon the compression obtained.

Liverpool Engineering Society.—On the 20th inst. Prof. Marchant read a paper on "Wireless Telegraphy and Telephony" before the Society.

Liverpool and District Electrical Association.—Through the courtesy of the manager, Mr. E. J. Hidden, a party of members of the above Association paid a visit on Saturday, January 16th, to the National Telephone Co.'s Royal Exchange, Great George Street, Liverpool, when a survey was made of the whole of the plant.

Royal Society of Arts.—On Monday Mr. G. L. Addenbrooke delivered the second of his Cantor lectures on the public supply of electric power in the United Kingdom.

Manchester Association of Engineers.—Mr. F. Carleton Anderson recently read a paper on "Experiments with Rolling Plant," in which the advantages of electric driving were pointed out.

Northampton Polytechnic Institute.—The annual prize distribution and conversazione will be held on Friday and Saturday, February 5th and 6th next. The Earl of Halsbury, P.C., will distribute the prizes on February 5th, and after the prize distribution the new buildings which have been recently erected in the courtyard with funds provided by the L.C.C. will be formally declared open. These buildings, five storeys in height, contain on the upper floors, large lecture rooms and classrooms; on the ground floor, staff rooms and rooms for the meetings of societies (*e.g.*, the Engineering Society) connected with the Institute; and on the basement floor, extensive additions to the workshops and laboratories of the Mechanical Engineering Department. After the above ceremonies, the whole of the laboratories, workshops, drawing offices and studios of the Institute both in the main building and in the British Horological Institute adjoining (the Technical Optics Department) will be on view in working order. The conversazione of members and students will be held on the following evening in both buildings.

Institution of Municipal Engineers.—At the general meeting on January 16th, the president, Mr. J. T. Pegge, read his inaugural address, in the course of which he said it was a matter for regret that the present legal status of an engineer and surveyor was not officially recognised, although the engineer was the principal spender of public moneys. Reasonable fixity of tenure of office, standard rates of salaries, and pensions according to length of service were matters for the institution to strive for. They were deeply indebted to the ability of Mr. Wyand, the secretary, for his admirable work in organising the institution.

On Tuesday Sir Fred. Treves gave a lecture at the London Hospital on "Radium in Surgery," in the course of which he stated that radium would cure every form of naevus—the port-wine stain, moles, &c.—would remove the itching of eczema, cure rodent ulcers, epitheliomata, etc. The secret of success lay in the use of a little radium spread over a large surface.

Annual Dinner.—The sixth annual dinner of the employés of Messrs. Rawlings Bros., Ltd., of South Kensington and Belgravia, was held at the Horseshoe Hotel, Tottenham Court Road, on Saturday evening last, when the number present was considerably in excess of previous records, taxing the capacity of the large hall to its utmost. The toast of "The Firm and Directors," briefly proposed by Mr. G. Mason, was responded to jointly by Mr. R. Tweedie Smith, the chairman of the company, and Mr. W. R. Rawlings. Mr. Smith referred to the work done by those who directed the affairs of the company, much of which was not appreciated because of its nature. Mr. W. R. Rawlings reported that the past financial year showed a marked improvement over the previous one, notwithstanding the depressed state of trade generally, and he was the first to acknowledge that, without the hearty co-operation of the employés, this happy result could not have been achieved. Mr. W. M. Hill proposed the toast of the "Visitors." Mr. Jno. Anderson responded. Mr. J. H. Wiggington (of Messrs. Taylor, Lovegrove & Co.) also responded, saying that, as a surveyor, it was in his opinion useless to cut prices, since no benefit accrued to anyone, not even to the customer. Mr. J. J. Rawlings, one of the managing directors, in proposing the toast of "The Employés," called it the most important toast of the evening. He was always glad to note the harmony that existed amongst the men, which could not but result successfully. He impressed upon them the importance of using their discretion when brought into contact with a client, as he had known instances where unnecessary trouble had been caused through a hasty statement. He noted with pleasure the satisfactory progress of the various departments of the business. Mr. F. B. Howard, in reply, thanked him in most felicitous terms. The speeches were interspersed with musical and other items. During the evening the chairman announced amid great enthusiasm that the firm would be willing to grant the necessary leave and full facilities to all those who joined the Territorial Forces.

Copper.—Messrs. Merton's mid-monthly return shows a falling off in visible supplies of 993 tons since the end of last month—a quantity which does not show up very markedly on the present high figures (54,684 tons). The drop is in copper at Liverpool and Swansea, and furnace material at the same places. Shipments for the half-month appear higher for Australia, but lower for Spain and Portugal. Deliveries on the mid-monthly figures have crept above supplies, the two figures being 17,430 and 18,423.

Commenting on the returns for last year, the *Financial Times* is inclined to think production will be ahead of demand. For the year it is estimated at 755,000 tons, against 720,000 in 1907. The present consumption in the United States does not warrant an increased production; there is, however, a considerable increase in that in Germany—194,825 tons in 1908, as against 167,217 in 1907.

The Chicago *Mining World* also takes an encouraging view as to production. One is inclined to look to Africa to develop its copper resources.

Tramway Supper.—On January 12th the staff of the Lincoln Corporation Tramways department held their annual supper and concert, a company of about 70 sitting down together. Councillor T. C. Halkes presided. Mr. S. Clegg replied to the toast of "The Tramway Employés."

Appointments Vacant.—Assistant mains superintendent for Rochdale (£91); fourth assistant engineer for Hammersmith (£130); improver for Perth Corporation Electricity Works.

National Volunteer Reserve.—A movement is on foot with the object of forming a voluntary force consisting of British-born civilians who have completed four years' efficient service in the Navy, Army or Volunteers, as a third line of home defence in time of war. The headquarters of this force, which we understand already comprises some 10,000 men, is at 222-5, Strand, London, W.C. At present no demands have been made upon those enrolled beyond the recording of their names and addresses. Application for enrolment should be made to Mr. M. C. St. J. Shepherd, 60, Queen Victoria Street, E.C., a member of council, stating rank and service. In view of the patriotic and practical objects of the movement, we have pleasure in commending it to the notice of those of our readers who are qualified to join it.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the Electrical Review *posted as to their movements.*

Central Station Officials.—A proposal of the E.L. Committee came before the Edinburgh Town Council last week that the salary of the station superintendent at M'Donald Road station be increased from £270 to £300 per annum by two annual increments of £15. A newspaper report says that "Mr. Rawson opposed the proposal on the several grounds that the maximum was fixed at £270, that any engineer could be got to do the work for £150, that they had refused 1s. a week to a scavenger, and that these times of unemployment was no time for increases." We regret to find that the Council was so far influenced by this kind of "argument" that on a division the increase was refused by 28 votes to 17.

Swansea Harbour Executive Committee, on 21st inst., Sir Griffith Thomas in the chair, further considered the appointment of an electrical engineer for the new King's Dock at a salary of £250 a year, when an unusual position arose. Four candidates had been selected to attend before the Committee, namely, Messrs. Hopkin Morgan (Port Talbot), J. P. Taylor (Leith), W. H. Lisson (Manchester), and J. Stormont (Glasgow). The last-named withdrew, and did not appear. The others were interviewed and the position was offered to the Leith applicant, but, to the surprise of the Committee, Mr. Taylor changed his mind and declined the offer. The Committee further considered the position, and then decided that as one candidate had withdrawn and another declined the offer it would be advisable to interview three other candidates (Messrs. Hincks, Pope and Fulton) who had been included in a penultimate short list. Mr. Hincks, who was electrical engineer at Wrexham, has since died (on the 21st inst.).

Mr. D. M. Kinghorn, electrical engineer to Southwark Borough Council, has resigned his position, but the report of the Electric Lighting Committee, which would have announced the reception of the resignation "with regret," was withdrawn at the last meeting of the Council. Mr. Kinghorn, dissatisfied with the coal delivered by the contractor, made large purchases, amounting to over £1,000, of other merchants without the knowledge of his Committee, and the Council is now in trouble with the contractor over a claim for £112 for demurrage. The reason for the withdrawal of the report referred to is that since the Committee considered the matter, and decided by a small majority to add "with regret" to the acceptance of the resignation, other purchases of coal not then disclosed have come to light.

The staff of the Exeter electricity department were entertained at dinner on Saturday night at the Bude Hotel, by Mr. H. D. Munro, the city electrical engineer, to meet Mr. T. P. Wilmshurst, the borough electrical engineer of Derby, who was formerly chief engineer to the late Exeter Electric Light Co. Several other old members of the staff were present. In proposing prosperity to the electricity department, Mr. Wilmshurst made reference to the difficulties that had been surmounted, both in the company's days and under the Corporation, in bringing the department to its present flourishing condition. An entertainment by members of the staff and friends followed. The opportunity was taken by the staff of presenting Mr. Munro with a mark of their esteem, which took the form of a roll-top davenport.

Mr. O. Hanson has accepted the terms offered by the Fleetwood District Council for the continuance of his services as engineer and manager of the electricity undertaking.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

Calmont, King & Co., Ltd. (97,616).—Particulars of £2,000 debentures, created by resolution of August 7th, 1908, have been filed pursuant to Sec. 10 (3) of the Companies' Act, 1907, the amount of present issue being £500. Property charged: Company's undertaking and property, present and future, including uncalled capital. No trustees.

S. Jevons, Ltd. (73,390).—A statement of the total amount outstanding on July 1st in respect of mortgages and charges created prior to that date and not required to be registered under Sec. 14 of the Companies' Act, 1900, has been filed pursuant to Sec. 12 of the Companies' Act, 1907. Particulars: Mortgage, dated 1903, securing £1,000.

Addinell & Co., Ltd. (96,825).—Particulars of two series of debentures (1st) for £200 and (2nd) for £300, created by resolutions of March 12th and August 8th, 1908, have been filed pursuant to Sec. 10 (3) of the Companies' Act, 1907, the amount of the present issues being £50 and £240 respectively. Property charged: Company's undertaking and property, present and future, including uncalled capital. No trustees.

S. H. Heywood & Co., Ltd. (94,586).—A statement of the total amount outstanding on July 1st in respect of mortgages and charges created prior to that date and not required to be registered under Sec. 14 of the Companies' Act, 1900, has been filed pursuant to Sec. 12 of the Companies' Act, 1907. Particulars: Mortgage dated 1901, securing £800.

Bostel Bros., Ltd. (Sanitary and electrical engineers, &c., Brighton) (98,735).—Particulars of £2,000 debentures, created July 16th, 1908, filed pursuant to Sec. 10 (3) of the Companies' Act, 1907, the whole amount being now issued.

Entwistle & Gass, Ltd. (Bolton) (29,147).—A statement of the total amount outstanding on July 1st in respect of mortgages and charges created prior to that date and not required to be registered under Sec. 14 of the Companies' Act, 1900, has been filed pursuant to Sec. 12 of the Companies' Act, 1907. Particulars: Debentures dated 1889, securing £10,900.

W. A. S. Benson & Co., Ltd. (metal workers, electricians, &c., London) (68,597).—A statement of the total amount outstanding on July 1st in respect of mortgages and charges created prior to that date and not required to be registered under Sec. 14 of the Companies' Act, 1900, has been filed pursuant to Sec. 12 of the Companies' Act, 1907. Particulars: Mortgages and charges dated 1907 and 1908, securing £9,500.

Templer & Ranoe, Ltd. (Electrical and mechanical engineers, Rugby), (60,703).—A statement of the total amount outstanding on July 1st in respect of mortgages and charges created prior to that date and not required to be registered under Sec. 14 of the Companies' Act, 1900, has been filed pursuant to Sec. 12 of the Companies' Act, 1907. Particulars: Mortgage dated 1907, securing £4,378 11s. 6d.

Tasker, Sons & Co., Ltd. (Rubber merchants, Sheffield), (78,374).—A statement of the total amount outstanding on July 1st in respect of mortgages and charges created prior to that date and not required to be registered under Sec. 14 of the Companies' Act, 1900, has been filed pursuant to Sec. 12 of the Companies' Act, 1907. Particulars: Mortgages dated 1901 and 1903, securing together £11,000.

Vaughan & Son, Ltd. (electrical engineers, West Gorton) (61,526).—A statement of the total amount outstanding on July 1st in respect of mortgages and charges created prior to that date and not required to be registered under Sec. 4 of the Companies' Act, 1900, has been filed pursuant to Sec. 12 of the Companies' Act, 1907. Particulars: Mortgage dated April 17th, 1900, securing £5,000.

Dargue, Griffiths & Co., Ltd. (electrical engineers, Liverpool) (18,858).—A statement of the total amount outstanding on July 1st in respect of mortgages and charges created prior to that date and not required to be registered under Sec. 14 of the Companies' Act, 1900, has been filed pursuant to Sec. 12 of the Companies' Act, 1907. Particulars: Indemnity and mortgage dated 1908, securing not more than £1,200.

Priestman Bros., Ltd. (electrical and general engineers, Hull) (63,920).—A statement of the total amount outstanding on July 1st in respect of mortgages and charges created prior to that date and not required to be registered under Sec. 14 of the Companies' Act, 1900, has been filed pursuant to Sec. 12 of the Companies' Act, 1907. Particulars: Mortgage dated 1908, securing £1,500.

B. Johnson & Son, Ltd. (Mechanical and electrical engineers, &c., Leeds) (100,403).—Particulars of £1,000 debentures created December 9th, 1908, filed pursuant to Sec. 10 (3) of the Companies' Act, 1907, the amount of the present issue being £1,900. Property charged: The company's undertaking and property, present and future, including uncalled capital. No trustees.

Leicestershire and Warwickshire Electric Power Syndicate, Ltd. (72,274).—Issue on January 11th of £150 debentures, part of series created July 9th, 1907, to secure £5,000, charged on the company's undertaking and property, present and future, including uncalled capital. No trustees. Previously issued of same series, £550.

Kinetic-Swanton Co., Ltd. (Electrical and general engineers, Lincoln and London).—A memorandum of satisfaction in full of debenture dated October 31st, 1904, securing £150, has been filed.

CITY NOTES.

Central London Railway Co.

The report of the directors for the half-year ending December 31st, 1908, shows that the chief item in the capital expended during the half-year (£8,268) was for the extension of the line from Shepherd's Bush to Wood Lane, which was completed in May of last year. Compared with the corresponding period in 1907 there has been an increase of £50,308 in the revenue receipts, and of £5,235 in the working expenses. The balance carried to net revenue is £104,693. After providing for interest on the debenture stock, and other payments, as shown by the net revenue account, there remains a balance of £118,386. The directors recommend the declaration of the following dividends: on the undivided ordinary stock at the rate of 3½ per cent. per annum, and on the preferred ordinary stock at the rate of 4 per cent. per annum, both for the half-year; on the deferred ordinary stock at the rate of 2½ per cent. per annum for the whole year. These will absorb £68,047, leaving a balance of £60,338. The directors recommend that £20,000 of this sum be credited to the reserve fund, increasing the total of the fund to £95,083, the balance of £40,338 being carried forward.

The attractions of the Franco-British Exhibition, which was held on a site adjoining the company's terminal station at Wood Lane, Shepherd's Bush, drew a large number of passengers to the line during the period between May 14th and the end of October last. It is satisfactory to report that this additional traffic, which was necessarily dealt with under considerable pressure at times, was carried without accident and without complaint.

Since the close of the Exhibition there has been a marked falling off in the company's daily business, due doubtless to the largely increased facilities for cheap short-distance travelling afforded by the motor and horse omnibus competition on the Oxford Street route. The directors are endeavouring to encourage the use of the railway by affording a more frequent service of trains; but it may also be necessary to consider the advisability of making a change in the present scales of fares, in order to meet this surface competition on more even terms.

The through bookings with other companies are progressing satisfactorily, and show that the convenience afforded is appreciated by the public.

The number of passengers, including those using through tickets and the cheap return tickets issued before 7.30 a.m., is as follows:—

Year.	Half-year ending June.	Half-year ending December.	Total.
1906	22,336,489	20,721,508	43,057,997
1907	20,260,871	16,646,620	36,907,491
1908	19,901,750	21,996,623	41,898,373
Total number carried			357,835,318

There was an increase of 5,350,003 in the number of passengers carried during the half-year. The average receipt per passenger is 2·03d., as compared with 2·01d. in the half-year ending December, 1907. The cost per passenger is 1·02d., as compared with 1·28d. in the corresponding period. A Bill has been deposited in Parliament to empower the Central London Co. to extend their line from the Bank station to and under the Liverpool Street station of the Great Eastern Co., with a connection to the adjacent Broad Street station of the North London Co. It also provides for exchange subways to be constructed between the Holborn station of the Great Northern, Piccadilly and Brompton Co., and the British Museum station of the Central London Co., and between the public subway at the Bank station of the Central London Co., and the booking hall of the City and South London Co. in Lombard Street. These additional connections will enable the companies concerned to further extend and improve the arrangements for through bookings at present in operation. The Bill further provides for the raising of £330,000 additional share capital, with borrowing powers of £110,000, and will be submitted to the proprietors at an extraordinary general meeting to be held at the close of the ordinary general meeting. The directors who retire by rotation are Lord St. Aldwyn, Lord Rathmore, and Mr. Henry Tennant. They are all eligible for re-election, but Mr. Tennant has intimated to the board that he does not desire to offer himself again. Mr. Tennant was one of the original directors of the company, and as chairman from June, 1895, to March, 1898, rendered important and valuable services during the construction of the railway and works.

Clontarf and Hill of Howth Tramroad Co.—The report for the year to December 31st shows a balance available for division of £634, out of which it is proposed to pay a dividend for the past half-year at the rate of 2 per cent. per annum, making with the interim dividend 2 per cent. for the year, and to carry forward £184.

Liverpool Overhead Railway Co.—The accounts for the past half-year show an available balance of £7,886, and the directors have resolved to recommend payment of a dividend at the rate of 5 per cent per annum on the preference shares. The balance carried forward is £4,210 against £4,179.

British Columbia Electric Railway Co., Ltd.—The directors announce a dividend at the rate of 5 per cent. per annum on the preferred ordinary stock for the half-year ended December 31st, 1908, together with an additional dividend at the rate of 1 per cent. per annum for the same period.

Westminster Electric Supply Corporation, Ltd.—The directors recommend, subject to final audit, the payment of a dividend at the rate of 10 per cent. per annum, less income-tax, for the half-year ended December 31st, 1908. For the same period in 1907, the ordinary dividend was at the same rate.

Metropolitan District Railway Co.—The directors announce a dividend of 1⅝ per cent. on the 4 per cent. guaranteed stock, the same rate as last year.

St. James' and Pall Mall Electric Light Co., Ltd.—The directors recommend a dividend on the preference shares for the half-year ending December 31st, 1908, of 3s 6d. per share, and 5s. per share on the ordinary shares, making, with the interim dividend paid on August 8th last, a total distribution of 7 per cent. on the preference and 10 per cent on the ordinary shares for the year. The total dividend on the ordinary shares in 1907 was at the same rate.

City and South London Railway Co.

On Tuesday, the Right Hon. C. B. Stuart Wortley presided over the forty-ninth ordinary general meeting of this company, held at the offices, 71, Finsbury Pavement, E.C.

The Chairman, in moving the adoption of the report (see Electrical Review, January 22nd, page 149), said the half-year was the second autumn half-year during which King's Cross and Euston had been accessible to passengers by the extended line. Speaking frankly, he could wish they could show a better result than a gross receipt lessened by £2,452. By savings in expenses the £2,452 loss on gross receipts was reduced to a net figure of £1,481. The amount available for distribution, however, was less than last year by £1,728. Under these circumstances they would be glad that the ordinary stockholders had not to forego more than a ¼ per cent. With a reduced number of passengers and less takings, they could not expect to show so good a percentage of working expenses to receipts; the percentage was only 46·61, against 46·42 last year. For the same reason the number of passengers per train, and the receipts per train, per train-mile, and per passenger, were all fractionally lower. But expenses per train-mile were also lower, being 1s. 2·16d., against 1s. 2·52d. per train-mile last year. Looking for the causes of the falling off in the traffic, it was difficult to find any dominating factor that told specially at any one or more places. The difficulty they had was that one could scarcely specify or discuss competitive services without advertising the routes of one's competitors. The only stations which showed an increase in bookings were Euston and King's Cross. In July last he said they were going to remove every discoverable thing that could possibly lead to the occurrence of a fire on any part of the system. The inquiry held last July by officers of the Board of Trade led to recommendations being made that they could not disregard, even if they would. Indeed, the preventive and protective works that they were in process of carrying out went further than the actual Board of Trade requirements of that day. They included the filling up of the inverts, or deep hollow spaces underneath the rails and platforms in those parts of the tubes which were built of larger diameter in order to provide room for the stations and their signal-boxes, sidings and other adjuncts. The experience of last July showed that these inverts were places where inflammable substances might lodge and give rise to fires in inaccessible places. In future they would be full up to the rail level of uninflammable ballast. The works included also the substitution of station platforms of stone or slate for platforms of wood, and the same substitution of uninflammable materials for others would be effected in the case of certain signal-boxes and other like structures. Then they intended to make a gradual substitution of slate for wood in all parts of the existing footway between the rails that were still made of wood. But besides these substantial works, they intended to go beyond the Board of Trade recommendations in respect of the very desirable new staircases which they were going to construct alongside their lifts at London Bridge. The expense of this would be shared with them, as was right, by the Brighton Railway Co., who were joint owners with them of the existing shaft and lifts, and who would share the benefit of the improved safety and convenience to passengers passing from one system to the other. All these works, which they hoped shareholders would think to be no more than prudence required, must, of course, cost money, but they thought they were justified in making the statement in the report that they could entail an ultimate annual charge of not more than £400 a year, which was based on an estimated capital cost of something under £10,000. They might have noticed that a Bill deposited by the Central London Railway, for submission to Parliament in the coming session, contained a clause for the construction of a new high level subway connecting their Bank Station with the booking hall of the company's Bank Station. This scheme was promoted with their concurrence, and on the understanding that they shared with the promoters the expense of construction. It was expected that their share would not exceed £3,500. They felt justified in incurring this obligation by consideration of the fact that the new subway could be made to give direct access to their own system. At present they had no frontage on that most important set of public subways which radiated outwards from the booking office of the Bank Station of the Central London Railway. They must not forget, also, that they connected with the South-Western Railway through the Waterloo and City. Throughout this central meeting place of footways and railways their name was at present nowhere mentioned underground, and nothing existed there to guide people to their station, or inform them of its existence. If they did know of the line and wanted to travel by it, they must either present a Central London ticket and cross underground, or they had to come to the surface and pick their way across the traffic. They thought it right that nothing should be left undone to make as accessible as possible, and as familiar as possible, the immense convenience that they offered to Londoners in enabling them to get from the very heart of the City to the three great railways of the North (to say nothing of the junction at Euston with the Hampstead Tube, and all that that meant in the future) in not more than 12½ minutes from station to station going to Euston, and 10½ minutes going to King's Cross or St. Pancras. So after much consideration they came to the conclusion that they ought not any longer to be without a high level subway connection such as that which Parliament was now to be asked to sanction. He could assure them that while they were making sacrifices in order to improve the comfort and safety of the passengers and to extend the popularity of the system, they did not lose sight of the ever-present need of keeping down expenses. In this matter they could have little from directors but precepts; but as regard practice no directors or shareholders were ever better served than they were by the managerial and executive staff. What with inquiry from the board and suggestion from them, he doubted whether any money-saving devices remained undiscussed. The shareholders might be sure that the board would leave unheeded no opportunity for economies that further experience or new inventions might suggest; so that all that was possible might be done to secure to them that return of the money risked which, as pioneers of underground electric traction, they so well deserved to receive.

Mr. C. S. Grenfell seconded the motion.

Mr. E. Levy suggested that all the railway companies should hold a conference so as to consider whether a station could be erected at the Bank by all the companies jointly. There should be through communication upon all the railways to the City.

Mr. Janule associated himself with the remarks of the last speaker, and criticised the lighting of the stations. He also complained of the slowness of the trains. He thought there was more delay on their line than on the other tubes.

Replying to the criticisms, the Chairman said that, as regarded prevention against fire, the company were taking every precaution against that danger. All their new trains were constructed of steel, and they had five trains of five carriages built of such material. They would give attention to the slowness of the trains, as the success of an undertaking such as theirs must depend on regularity and punctuality.

The report was adopted.

Chatham and District Light Railways Co.

The directors' report for the half-year ended December 31st, 1908, states that the receipts were £22,831, and the expenses £13,929, leaving £8,901; less rent of Rochester Corporation lines £1,801, interest on debentures £1,234, interest on loans, &c., £78; amount written off as per revenue account £49 = £3,162; add balance brought forward from June 30th, 1908, £1,494, leaving a balance of £7,233. Of this amount £3,000 has been transferred to reserve for depreciation, and the directors recommend that the balance be disposed of as follows:—£2,940 to dividend at the rate of 5 per cent. per annum on the preference for the half-year; £1,060 to dividend at the rate of 2 per cent. per annum on the ordinary shares for the half-year; and £233 to revenue new account. The whole of the Rochester Corporation lines are now completed and leased to the company, the last, Delce to Borstal, being opened in August. The traffic receipts show an increase of about £2,500 over those for the corresponding half-year of 1907. This increase is entirely due to the additional lines (2·62 miles) opened during the past year, from which, however, much better results were anticipated. The directors hope that with an improvement in the present depressed condition of trade, the results will be more satisfactory.

Metropolitan Railway Co.

The directors report that the total receipts for the half-year ending December 31st, 1908, amounted to £376,287, and the expenses to £202,044, leaving a profit of £174,242. Compared with the corresponding half-year of 1907, the receipts show an increase of £28,635 and the expenses an increase of £10,085. The net revenue account, after providing for the interest upon the debenture stocks and other fixed charges, and placing £17,000 to the electrical renewal and depreciation fund, shows a balance of £127,535, which will permit of the payment of the dividends upon the preference stocks, and leave a balance of £23,024 available for dividend upon the ordinary stock. The directors recommend the proprietors to declare a dividend upon the ordinary stock for the past half-year at the rate of 10s. per cent. per annum, and to carry forward the balance of £8,694 to the next half-year's accounts. The Surplus Lands Committee announce that the dividend on the surplus lands stock for the past half-year will be at the rate of £3 per cent. per annum. In crediting the electrical renewal and depreciation fund with £17,000, and thus strengthening the financial position of the company, the directors believe that they are pursuing a wise policy, especially having regard to the fact that a considerable proportion of the increased revenue of the half-year was derived from a special source, viz., the Franco-British Exhibition traffic, and also bearing in mind that it has not been possible during the past two or three years to build up that fund to the extent that the board considers is desirable. The fund in question now stands at £47,450. The improved train services brought into operation on the Inner Circle, Hammersmith and St. John's Wood lines in October last, together with the through bookings with the tube railways, have led to a considerable development in the traffic. The number of passengers carried during the year 1908 was greater than in any year in the history of the company. The installation of automatic signalling on the Inner Circle line will be completed during the current half-year. The traffic in connection with the Franco-British Exhibition during the first four months of the half-year was very heavy, and it is estimated that more than five million passengers passed through the Wood Lane Station constructed specially for the purpose by this company and the Great Western Co. jointly. The arrangements made for the transit of this large number of passengers were carried through without a hitch, notwithstanding the great pressure upon the company's resources which was at times experienced. A substantial portion of the increase in expenditure shown in the accounts was due to the necessity for providing for the additional traffic thus conveyed. The station

will, it is expected, be largely used again during the coming summer by visitors to the Imperial International Exhibition, which is to be opened in May next on the same site, and should prove a source of considerable benefit to the company. It is not the intention of the directors to introduce any Bill into Parliament next session. Any Bills deposited by other companies which would appear to affect prejudicially the interests of this company will be closely watched by the board, and opposed where necessary. The electrical plant and machinery have worked smoothly during the past half-year, and the current has been produced at an exceptionally low figure per unit. The progress of the traffic carried on the railway is shown in the following table:—

Year.		Passengers.		Gross receipts for passengers, goods, minerals and tolls.
1905	..	95,694,616	..	£832,034
1906	..	98,334,766	..	681,268
1907	..	96,859,103	..	640,838
1908	..	99,846,735	..	680,357
Total..		3,134,485,327	..	£25,794,500

Direct United States Cable Co., Ltd.

The sixty-third ordinary general meeting was held on Tuesday at Winchester House, E.C.

Mr. E. M. Underdown, K.C., who presided, said that the revenue account for the six months ending December 31st, after deducting outpayments, amounted to £56,335. The working and other expenses, including income-tax, but excluding the cost of cable maintenance, absorbed £25,357, leaving a balance of £30,978 as net profit. To this was to be added £2,812, brought forward from the previous half-year, giving a total of £33,790. This had been appropriated as follows:—An interim dividend of 4s. per share was paid up at September 30th, amounting to £12,142, and a similar amount was paid up to December 31st; £5,000 was set aside to the reserve fund, and £4,506 carried forward to the current half-year. The revenue, compared with the corresponding period of 1907, showed a reduction of £1,933, which could hardly be viewed as unfavourable, inasmuch as they must remember the serious depression in trade which existed, more or less, during the whole year. London expenses were practically unchanged, but showed a reduction of £26. Stations showed a small increase, due to the maintenance of buildings and to Continental agencies. On the whole, there was an increase of £105, but the salaries and wages and maintenance of instruments, showed a decrease. As to the other expenditure, there was a reduction on the use of patents—an item which now disappeared from the accounts—and an increase of £230 in income-tax, which was an item over which the board had no control. The ordinary expenditure, on the whole, showed an increase of £254, of which £230 was accounted for by increased income-tax. The most important item was, of course, the reserve fund. During the period this fund had been debited with £11,043 for the maintenance of cables. No doubt this was heavy, for they had had several repairs, which, however, had been executed with the utmost dispatch, and he did not think that at any time a cable was out of work for more than a few days. One could not but speak in the highest praise of the way in which the companies who owned the repairing ships carried out this work, very often in very bad weather, but apparently they were now so accustomed to carrying out such operations that they did not seem of nearly so terrible a character as used to be assumed. They had also spent £505 in installing acetylene gas light at the Irish cable station, which they hoped would greatly benefit the station and staff. They had a considerable staff stationed at their somewhat inhospitable station on the west coast of Ireland, and for a long time nothing had been done to improve their accommodation. Naturally, electric light was out of the question, but it appeared that the acetylene gas was very useful for their purposes. On the other hand, the reserve fund had been credited with £9,149 for interest on investments, with £92 profit on the sale of securities, and with £5,000 set aside from revenue, and the fund now stood at £507,890. They were going on steadily, and he trusted that they would have future prosperity.

Sir James Pender, Bt., seconded the motion.

Dr. Berry asked whether the Marconi system was likely to prejudicially affect the company.

The Chairman said he did not think it would affect them unfavourably. There was no doubt that for certain things wireless telegraphy was turning out to be a very important business, but he did not see how it could affect their operations unless matters should change very materially from the position they were now in.

Mr. Roberts asked if there was anything in the rumour that the Government were being asked to work a cable of their own to Canada.

The Chairman said it would be too long a question to go into, but he had seen nothing serious on which to found an opinion.

The report was then adopted.

Blackpool and Fleetwood Tramroad Co.—On Thursday last week the directors have resolved to pay out of an available balance of £10,804 for the past year a dividend of 9 per cent. per annum for the half-year ending December 31st, 1908. They also recommend that £1,500 be placed to depreciation reserve, £500 to the general reserve, £2,053 being carried forward to the current half-year.

Prospectuses.—*Chiswick Electricity Supply Corporation, Ltd.*—The list of subscriptions for an issue of 4½ per cent. first mortgage debenture stock in this company is to close to-morrow, Saturday. Of a total amount of £80,000 there has already been allotted £20,000, and £60,000 has been purchased under contract by the General Investors and Trustees, Ltd., who are offering it for sale at the price of 95 per cent. The stock constitutes a specific first charge on the leasehold and freehold lands, buildings and fixed plant of the corporation, also its undertakings and rights, at Chiswick and Aberystwyth, and a first floating charge on the remaining assets. The prospectus contains a full statement of the property and prospects of the company, prepared by Mr. W. B. Esson, the managing director. At the end of 1907 there were 66,580 lamps (equivalent 8 c.p.) connected, producing a total revenue of £14,608, of which £6,346 profit was distributed in interest and dividends. The dividend on the ordinary shares in that year was 6 per cent., and in preceding years the rates were 6 per cent., 5½ per cent., 4½ per cent., 3 per cent. and 1½ per cent., the last-named figure being for the year 1902. To pay interest on the present issue of debentures requires £3,600 per annum, for which the whole of the net revenue is available. The capital expenditure at the two places named has been £110,828. It is stated that the £80,000 debenture stock was created for retiring an issue of £50,000 debentures (which have now been cancelled), to pay off temporary loans, and to provide further capital for extensions. When such extensions have been made the capital expenditure will exceed £128,000. At both Aberystwyth and Chiswick there is a good deal of land either developing or awaiting development for building purposes, in the company's areas. Of £100,000 authorised share capital, £62,800 ordinary shares have been issued and are fully paid.

Anglo-Argentine Tramways Co., Ltd.—This company has been offering £3,487,444 4 per cent. debenture stock at £90, to rank *pari passu* with £565,000 stock already issued.

Anglo-American Telegraph Co., Ltd.—The board has resolved, after placing £10,000 to the credit of the renewal fund for the half-year, to recommend at the meeting to be held on February 5th, a balance dividend of 19s. per cent. upon the ordinary consolidated stock; a balance dividend of £1 10s. per cent. upon the preferred stock; and a first and final dividend of 8s. per cent. upon the deferred stock—all for the year ending December 31st, 1908, and all payable on February 6th, less income-tax. A balance of about £1,565 will remain to be carried forward. The foregoing dividends, together with those already paid, will amount to £3 4s. per cent. on the ordinary consolidated stock, £6 per cent. on the preferred stock, and 8s. per cent. on the deferred stock for the year 1908. The register of transfers are closed from January 20th to February 5th, inclusive.

Power-Gas Corporation, Ltd.—Mr. Alfred Mond, M.P., at the annual meeting of this corporation, said that the general engineering business last year was extremely bad, and the company's business suffered from the North-East Coast strike. The power-gas business, however, had been considerably better. Satisfactory developments had been made in the export trade connected with power-gas business, plant having been erected in China and Japan. They were erecting three plants (one each in Italy, Germany, and the East Coast of England) for the utilisation of peat in gas-producers, for making gas and recovering sulphate of ammonia, and they anticipated successful results. Their general engineering prospects were now better, although they were disappointed that the general engineering industry of the country had not recovered as it ought to have done. Prices had been cut so low, that on the execution of large orders there was little profit. It was the directors' endeavour to carry on the business on sound lines until the engineers could be satisfied that the gas engine could be run continuously with success.

Stock Exchange Notices.—The Committee has ordered the undermentioned securities to be quoted in the Official List:—

Metropolitan Electric Tramways, Ltd.—Further issue of £76,200 4½ per cent. debenture stock.

Applications have been made to the Committee to appoint a special settling day in and to grant a quotation to:—

Rio de Janeiro Tramway, Light and Power Co., Ltd.—£1,150,000 5 per cent 50-year mortgage bonds of £100 each.

And to allow the following securities to be quoted in the Official List:—

Indian Electric Supply and Traction Co., Ltd.—25,000 ordinary shares of £5 each, fully paid, Nos. 1,008 to 26,007, in lieu of the £125,000 6 per cent. construction debenture stock now quoted, together with 1,007 additional ordinary shares of £5 each, fully paid, Nos. 1 to 1,007.

Malacca Rubber Plantations, Ltd.—185,000 ordinary shares of £1 each, fully paid, Nos. 115,001 to 300,000 (special application).

Telephone Co. of Egypt, Ltd.—Further issue of £60,000 4½ per cent. debenture stock.

Calcutta Electric Supply Corporation, Ltd.—The number of units delivered to consumers during the four weeks ended December 25th, 1908, were 387,463, compared with 290,548 units in the corresponding four weeks of 1907.

Belgium.—La Société d'Electricité de et à Louvain is the name of a new company which has just been formed in Louvain with a capital of £12,000.

Austria-Hungary.—La Société des Lampes Electriques Z pour Autriche-Hongrie is the name of a new company which has just been formed in Brussels with a capital of £18,000.

ELECTRIC TRAMWAY AND RAILWAY TRAFFIC RETURNS.

Locality.	Fortnight ended.	Receipts for the fortnight.		No. of wks.	Total to date.		Route miles open.	
		£	£*		£	£*		Inc.
Aberdeen	Jan. 20	2,585	+ 142	34	47,962	— 95	14·4	..
Ayr	,, 23	345	..	36	11,214	— 217	8	..
Bath	,, 20	1,255	+ 148	3	1,911	+ 233	18	..
Belfast	,, 22	6,944	+ 239	43	156,711	+ 598	18·5½	..
Birkenhead	,, 24	1,999	+ 142	43	45,814	+ 7,913	56·46	..
Birmingham Corp.	,, 16	12,888	+ 491	41	267,900	+ 92	8·25	..
Blackpool-Fleetw'd	,, 23	426	+ 76	3	780	+ 1,598	25	..
Bolton	,, 20	4,079	+ 149	43	99,190	— 3,153	21·7	..
Bournemouth ..	,, 24	2,654	+ 122	41½	69,622	+ 770	54·9	..
Bradford	,, 23	8,515	+ 452	42	199,285	+ 953	9·5	..
Brighton	,, 24	1,409	+ 113	42	39,527	..	31	..
Bristol	,, 22	9,735	+ 610	..	..	..	..	..
Brit. Elec. Trac. Co.	Jan. 15	442	+ 31	2½	501	+ 51	3·65	..
Airdrie	,, 15	317	+ 18	,,	389	+ 21	..	..
Barnsley	,, 15	385	— 24	,,	409	— 21	5·37	..
Barrow	,, 15	105	— 1	,,	113	..	..	..
Cavehill	,, 15	973	+ 112	,,	1,055	+ 140	8 85	..
Devonport	,, 15	1,892	+ 16	,,	2,086	+ 1	6·5	..
Gateshead	,, 15	862	— 2	,,	886	— 20	7·25	..
Gravesend	,, 15	827	+ 4	,,	914	+ 30	6 72	..
Greenock	,, 15	410	— 31	,,	443	— 6	..	..
Hartlepool	,, 15	163	+ 6	,,	173	+ 63	3	..
Kidderminster ..	,, 15	295	+ 57	,,	317	+ 95	2·9	..
Leamington	,, 15	400	+ 82	,,	424	+ 2,134	22	..
Merthyr	,, 15	10,924	+2,007	,,	11,609	+ 19	8·5	..
Metropolitan ..	,, 15	563	+ 10	,,	607	+ 601	..	..
Middleton	,, 15	10,220	+ 12	,,	10,607	— 32	9·13	..
Mid. Joint Com'tee	,, 15	1,020	— 46	,,	1,100	— 7	5·31	..
Oldham—Ashton	,, 15	188	— 9	,,	202	— 157	29	..
Peterborough ..	,, 15	3,472	— 99	,,	3,690	+ 28	2·75	..
Potteries	,, 15	100	+ 19	,,	120	+ 89	8·17	..
Rotherham	,, 15	456	+ 83	,,	489	— 177	..	..
Southport	,, 15	1,412	+ 145	,,	1,501	+ 193	12·5	..
S. Metropolitan ..	,, 15	1,743	— 160	,,	1,868	— 24	3·75	..
Swansea	,, 15	258	— 17	,,	284	+ 7	3	..
Tynemouth	,, 15	61	+ 7	,,	55	+ 67	5·75	..
Weston-s-Mare ..	,, 15	508	+ 63	,,	546	+ 23	..	..
‡Worcester	,, 15	183	+ 21	,,	191	+ 101	17	..
Wrexham	,, 15	1,704	+ 72	,,	1,821	+ 3	..	..
Yorks. Wool. Dist.	,, 15	353	— 1	,,	383	..	7·5	..
Miscellaneous ..	,, 15	..	..	..	..	..	..	..
Burnley	Jan. 23	2,211	— 127	..	..	..	..	..
Burton-on-Trent ..	,, 24	470	+ 6	43	11,577	— 591	10	..
Bury	,, 23	1,943	+ 72	49½	49,490	+ 1,705	22·5	..
†Cardiff	,, 2	4,062	+ 246	48	92,556	+ 413	..	..
†Carlisle	,, 21	154	— 1	52	2,210	— 34	..	..
Chatham and Dist.	,, 21	1,465	+ 826	3	2,243	+ 345	14·98	2·77
Cork	,, 15	2,644	+ 297	42	1,282	+ 56	9·9	..
Croydon	,, 23	3 8	— 12	43	69,132	— 272	11 25	·75
Darlington	,, 22	446	— 1	42	4,425	— 677	..	..
Darwen	,, 16	312	— 4	42	10,642	— 288	4·86	..
Dover	,, 22	9,636	+ 298	..	9,119	— 412	4 75	..
Dublin	,, 20	2,187	+ 84	34½	15,601	+ 774	54·25	5·5
Dundee	,, 23	1,790	+ 219	43	41,681	+ 1,402	14·5	..
East Ham	,, 22	527	+ 65	42	37,997	— 755	8·43	·68
Exeter	,, 23	31 407	— 135	..	13,543	+ 823	5·5	..
Glasgow	,, 21	1,416	+ 29	..	581,158	—10,459	90·5	1·5
Hastings	,, 23	2,860	+ 68	43	..	..	..	..
Huddersfield ..	,, 23	4,880	+ 126	43	68,038	— 394	28·5	·5
Hull	,, 20	236	+ 4	42	106,084	— 340	13	..
Ilkeston	,, 23	602	+ 31	43	5,891	— 79	3·5	..
Ipswich	,, 16	299	+ 29	35	16,888	— 263	10·5	..
Kilmarnock	,, 21	2,105	— 212	3	5,181	— 252	4·25	..
Lan'kshire Trm.Co.	,, 20	2,249	+ 152	..	3,961	— 400	17	1·18
Lancashire United	,, 16	12,221	+ 808	39	276,165	+ 3,611	96·10	1
Leeds	,, 23	3,974	+ 78	..	8,456	+ 280	20	·25
Leicester	,, 16	994	+ 57	35½	..	..	..	..
Leith	,, 16	21,221	+1,198	2½	18,769	+ 35	6	..
Liverpool	,, 9	63,203	+15,342	..	24,939	+ 1,795	104	4·25
†L.C.C.	,, 23	10,161	+ 486	..	1,129,200	+158,686	121	..
London United ..	,, 23	244	— 23	17	16,885	+ 685	..	..
Lowestoft	,, 23	27,895	+1,186	43	2,613	— 174	3·5	..
Manchester	,, 23	7,554	+ 25	43	646.130	+16,768	90·5	6
Newcastle	,, 16	595	+ 34	42	167,468	— 8,408	..	..
†Newport	,, 24	3,575	+ 263	43	27,579	— 1,128	14·5	..
Oldham	,, 2	792	+ 122	40	84,298	— 227	23·75	..
Pontypridd	,, 23	3 206	+ 359	43	15,325	+ 4,294	5·5	1·75
Portsmouth	,, 20	1,382	+ 78	..	85,977	+ 1,283	14·5	..
Preston	,, 14	1,170	+ 104	41	..	..	..	..
†Reading	,, 21	1,110	+ 3	42½	25.993	+ 11	13·25	..
Rotherham	,, 18	3,375	+ 57	42	25.993	+ 19	10	·66
Salford	,, 24	10 526	— 84	43½	195,020	+ 390	41	..
Sheffield	,, 20	1,955	+ 228	42	241.938	— 3,239	97	1·25
Southampton ..	,, 20	591	+ 195	43	45,445	+ 1,813	..	..
Southend-on-Sea ..	,, 23	996	+ 51	..	19,170	+ 1,913	..	..
South Shields ..	,, 18	117	— 112	..	24,075	— 289	..	..
†Swindon	,, 20	784	+ 43	3	..	..	4·4	..
Tynemide	,, 16	1,604	+ 207	41½	1.086	— 80	8·87	..
Wallasey	,, 23	1,002	+ 100	43	37,881	+ 2,126	8·72	·22
Walthamstow ..	,, 14	4,364	— 164	42	27,140	+ 1,417	9	..
West Ham	,, 20	1,551	+ 73	42	93,045	— 4,148	15	·3
Wolverhampton ..					85,240	— 851	19·5	..
Baker St.-Waterloo	Jan. 23	6,885	+ 715	3	10.315	+ 915	4·25	1
Cen. London Rly...	,, 23	11,274	+1,217	3	16,967	— 1,242	6·32	·55
Char. +. Eus. Hamp.	,, 23	7,715	+1,855	3	11,595	+ 2,075	7·75	..
City & S. Lon. Rly.	,, 24	6 638	+ 290	3	10,141	— 340	7·3	1·06
Dublin-Lucan Rly.	,, 8	222	+ 39	..	..	..	7	..
G.N. and City Rly.	,, 23	3 173	— 557	3	4,768	— 882	3·5	..
G.N., P'dy. & Brmtn	,, 23	11,810	+ 980	3	17,780	+ 1,455	9·25	·25
†L'pool Overh'd Rly	,, 24	2,724	— 8	3	5,378	— 30	6·3	4·2
Mersey Railway ..	,, 23	3,977	+ 154	3	5,974	+ 280	4·5	..
Metropolitan Rly.	,, 24	22,555	+1,131	..	48,241	+ 1,659	24·5	..
Met. District Rly...	,, 23	19,909	+1,976	3	29,824	+ 2,909	24	..
Anglo-Argentine ..	,, 21	51.801	+ 16,708	..	79,859	+ 25 988	43	..
‡Auckland	Dec. 31	13,781	+ 3,414	52	163.651	+ 25 988	22·3	3·1
Bombay (B.B.T.) ..	,, 24	5,154	+ 513	51	124,495	+ 20,387	..	..
‡Brisbane	Dec.	16,655	+ 1,855	..	..	..	..	..
Calcutta	Jan. 23	7,066	+ 40	..	..	..	20·5	..
‡Kalgoorlie, W.A...	,, 15	4,855	..	52	47,312	..	12·75	..
Madras	,, 15	1.489	+ 127	..	..	..	23·6	..
Perth (W.A.) ..	,, 22	3,040	+ 45	3	4,876	+ 59	..	..

* Compared with the corresponding period of 1908. † One week only.
‡ Includes horse, steam and other receipts. § One month.

STOCKS AND SHARES.

Tuesday Afternoon.

Some in the Stock Exchange declare that they have seldom seen quieter days for business, even in the middle of the summer-time. Certainly the general volume of business is very sluggish, and only in certain sections does activity animate values. The Mexican Tramways group is lively enough as regards movements in prices, while the dividend declarations have infused a little more life than usual into Home Railway stocks.

Central Londons all gained 2 points upon the announcement that the dividend on the Deferred would be 2½ per cent. for the year, as against 2 per cent. a year ago. Making allowance for Exhibition influences, the market regarded the result as distinctly good, but optimism was rather dashed by the report, out on Monday last, wherein the directors referred afresh to the omnibus competition, and the possibility of another re-arrangement of fares becoming necessary. The extension of the line to Liverpool Street, already referred to here, must now be looked upon as one of the chief hopes of holders, and as completion is so far off, there is plenty of scope for fancy to weave a hundred fabrics round the anticipation of what traffics will be like when the work, not yet started, is finished. On the issue of the report half of the previous advances were lost, so that prices stand at a gain of 1 each.

City and South London stock was unaffected by the issue of the report. Metropolitan Consols drooped to 36½, but the Underground Electric Railway issues are again considerably better, on the steady growth of traffics on the Tube lines under the company's control. Baker Street and Waterloo Debenture stock is 95 (ex dividend. Great Northern Piccadilly and Brompton shares rose 10s. to 8, and the Debenture to 92, while Charing Cross and Euston Debenture improved to 89. Districts are 14, all better.

Publication of the terms upon which the Mexico Tramways Company is to absorb—or to be amalgamated with—the Mexican Light and Power undertaking led to another furious outburst of gambling, in the course of which the Power shares were rushed up to 91. A weak account was declared to be the result, and consequently there came a shake-out which had the effect of frightening some of the holders, and shares were sold freely. The wire-pullers have been rattling prices up and down at a rate sufficient to make the average investor gasp, but long-headed men in the Stock Exchange have no hesitation in voting Mexican Light and Power shares too high at the present price of 86 if the Tramway stock is worth no more than the current quotation of 142. The 5 per cent. gold bonds of both concerns are quoted about 93, and look, as we have said before, a reasonably cheap investment. Kaministiquia 5 per cent. bonds are a point to the good, and Electrical Development of Ontario 5 per cent. gold bonds at 86 are also 1 up. Canadian General Common, however, fell 1½ to 106. Rio Trams soared to 90½, a 2½ rise.

The new Argentine Tramways 4 per cent. Debenture stock prospectus, offering the very large amount of nearly 3½ million pounds, caused the price of the existing 4 per cent. Debenture to ease off to 90, the same as that at which the new stock is offered. Dealers resolutely declined to make any sort of price in the latter until after allotment. British Columbia Deferred is 1 better, though the 5 per cent. Perpetual Preference eased off a little. It is of interest to notice the Canadian Pacific announcing that its new line on the Rocky Mountain section will be operated by electricity.

Supply shares are dullish, with small changes in several of the best-known varieties. Bromptons, Metropolitans and City Lights fell 2s. 6d. each; the same fraction has been deducted from County Preference. Newcastle-on-Tyne Ordinary are again lower this week to the extent of 5s. Victoria Falls Power Preference hardened ⅛ to 17s. 6d. upon a scheme of alliance with another Rand concern. The Chiswick Electricity Supply Company has been offering a small amount of Debenture stock. There are many better investments obtainable.

London United Tramways issues are decidedly better, the Preference shares gaining 7s. 6d., and the Debenture stock 2 points.

The announcement of a dividend of 8s. per cent. on Anglo-American Telegraph Deferred, against 20s. this time last year, led to a sharp fall in the price of the stock. Market anticipations had fixed upon 10s. as the probable distribution. The company's Ordinary and Preferred are also lower, and Direct United States Cable shares gave way in sympathy. Otherwise, the telegraph catalogue is featureless. National Telephone Preferred reacted a trifle, and the Second Preference are 5s. lower. Telegraph Constructions at 33 show a rise of 10s., which is the only quotable change amongst manufacturing descriptions.

SHARE LIST OF ELECTRICAL COMPANIES.

TELEGRAPH AND TELEPHONE COMPANIES.

Present Issue.	NAME.	Stock or Share. *	Dividends for the last four years. 1905.	1906.	1907.	1908.	Closing Quotations Jan. 19th.	Closing Quotations Jan. 26th.	Business done week ended Jan. 26th, 1909. Highest.	Lowest.	Rise + or Fall −	Present Yield per cent. £ s. d.
25,000	Amazon Telegraph Co.'s shares, Nos. 1 to 25,000	10	Nil	Nil	Nil	..	2⅜ — 2⅝	2⅜ — 2⅝	..	..	..	Nil.
186,700	Do. do. 5 % Debs., Nos. 1 to 1,250 Red.	100	5 %	5 %	5 %	5 %	92 — 95	92 — 95	..	..	..	5 3 1
$181,551,400	American Telephone & Telegraph, Cap. Stock ..	$100	7½%	8 %	8 %	..	128 —131	128 —131	..	..	..	6 2 2
$58,000,000	Do. Collat. Trust, 4% Bonds, 1 to 28,000 and 58,001 to 78,000	$1000	4 %	4 %	4 %	4 %	94 — 96	94 — 96	..	..	..	4 8 4
598,180	Anglo-American Telegraph	Stock	32½%	32½%	34½%	£3 4s.	55 — 58	54 — 57	55½	54½	— 1	5 12 6
3,200,910	Do. do. do. 6 % Pref.	Stock	6 %	6 %	6 %	6 %	9 ¼ — 9⅝	96 — 98	97¼	96⅜	— ⅜	6 2 5
3,200,910	Do. do. do. Deferred	Stock	½%	12½%	1 %	8/-	14⅛ — 15⅛	13⅝ — 13⅝	16	13⅝	—1½	2 19 6
50,000	Anglo-Portuguese Tel., 5 % Mort. Deb. Stock Red.	100	5 %	5 %	5 %	5 %	100 —102	100 —102	100¼	..	..	4 18 0
44,000	Chili Telephone, Nos. 1 to 44,000	5	8 %	8 %	8 %	..	7⅞ — 8⅛xd	7⅞ — 8⅛	7⅞	..	..	4 15 6
2,888,376	Commercial Cable Stlng. 500 year 4 % Deb. Sk. Red.	Stock	4 %	4 %	4 %	4 %	85½ — 87½	85 — 87	85⅞	85	— ½	4 12 0
16,000	Cuba Telegraph	10	5 %	5 %	6 %	..	7½ — 8½	7⅞ — 8½	7⅞	..	..	7 1 9
6,000	Do. 10 % Pref.	10	10 %	10 %	10 %	10 %	16½ — 17½	16½ — 17½	..	..	..	5 14 3
12,931	Direct Spanish Telegraph, Ord.	5	4 %	4 %	4 %	..	3 — 3½	3 — 3½	..	..	..	5 14 3
6,000	Do. do. 10 % Cum. Pref. ..	5	10 %	10 %	10 %	..	8 — 9	8 — 9	..	..	..	5 8 1
80,000	Do. do. 4½ % Debs.	50	4½%	4½%	4½%	4½%	99 —102	99 —102	..	..	..	8 16 6
60,710	Direct United States Cable	20	4½%	4½%	4½%	4½%	12⅜ — 12¾xd	12 — 12½	12⅞	12	— ⅜	6 16 0
48,000	Direct W. India Cable, 4½ % Reg. Deb., 1 to 1,200, R.	100	4½%	4½%	4½%	4½%	100 —102	99 —103	100¼	..	—1	4 7 2
4,000,000	Eastern Telegraph, Ord. Stock..	Stock	7 %	7 %	7 %	..	126 —129	126 —129	127½	126	..	5 8 6
2,000,000	Do. 84 % Pref. Stock..	100	84½%	84½%	84½%	..	84 — 87	84 — 87	86	84	..	4 0 6
1,896,706	Do. 4 % Mort. Deb. Stock. Red. ..	Stock	4 %	4 %	4 %	4 %	103½—105½	103½—105½	104½	103	..	3 17 8
800,000	Eastern Extension, Australasia, and China Tele.	10	7 %	7 %	7 %	..	11½ — 12½	11½ — 12½	12⅛	11½	..	5 14 3
752,400	Do. 4 % Deb. Stock	Stock	4 %	4 %	4 %	4 %	101 —103	101 —103	102¼	102⅛	..	3 17 8
269,700	East & S. Afric. Tel., 4 % Mt. Db., 1 to 8,000, red. 1909	100	4 %	4 %	4 %	4 %	101 —103	101 —103	..	..	..	3 17 8
200,000	Do. 4 % Reg. M. Debs. (Mauritius Sub.) 1 to 8,000	25	4 %	4 %	4 %	4 %	100 —102	100 —102	..	..	..	3 18 5
181,127	Globe Telegraph and Trust	10	5½%	5½%	5½%	..	10 — 10¼	10 — 10¼	10⅝	10	..	5 14 8
181,127	Do. do. 6 % Pref..	10	6 %	6 %	6 %	..	12⅞ — 13⅜	12⅞ — 13⅜	13¼	14	..	4 7 3
150,000	Great Northern Telegraph, of Copenhagen.. ..	10	24%	20 %	20 %	..	30 — 32	30 — 32	31½	30⅜	..	6 5 0
14,800	Halifax and Bermudas Cable, 4½ % 1st Mort. Debs., within Nos. 1 to 1,200, Red.	100	4½%	4½%	4½%	4½%	100 —102	100 —102	..	..	..	4 8 8
17,000	Indo-European Telegraph	25	13 %	13 %	13 %	..	52 — 55	52 — 55	54	..	..	6 16 4
$41,380,400	Mackay Companies Common	$100	2 %	3½%	4 %	..	74 — 78	74 — 78	..	..	..	5 2 7
$50,000,000	Do. do. 4% Cum. Pref.	$100	4 %	4 %	4 %	..	71 — 74	71 — 74	..	..	..	5 12 8
294,190	Marconi's Wireless Telegraph	1	Nil	Nil	Nil	..	⅛ — ⅜	⅛ — ⅜	10/6	10/3	..	Nil
72,680	Monte Video Telephone Co., Ltd. Ord.	1	5 %	6 %	6 %	..	3⅜ — 3¾	3⅜ — 3¾	..	..	..	6 0 9
86,492	Do. do. do. 5 % Pref. ..	1	5 %	5 %	5 %	..	3⅝ — 3¾	3⅝ — 3¾	..	..	..	5 3 11
2,225,000	National Telephone, Pref. Stock	100	6 %	6 %	6 %	..	109½—111½	109 — 111	110⅝	110	— ½	5 7 7
3,725,000	Do. do. Def. Stock	100	5 %	5 %	6 %	..	122 —124	122 —124	123½	121½	..	4 16 9
15,000	Do. do. 6 % Cum. 1st. Pref. ..	10	6 %	6 %	6 %	6 %	10½ — 11½	10½ — 11½	11	..	..	5 4 4
15,000	Do. do. 6 % Cum. 2nd Pref.	10	6 %	6 %	6 %	6 %	10½ — 11½	10½ — 11½	..	..	— ½	5 6 8
250,000	Do. do. 5 % Non-cum. 3rd P., 1 to 250,000	5	5 %	5 %	5 %	5 %	5⅝ — 5¾	5⅝ — 5¾	5¾	5⅝	..	4 5 1
2,000,000	Do. do. 3½ % Deb. Stock Red. ..	Stock	3½%	3½%	3½%	3½%	97 — 99	97 — 99	97½	..	..	3 10 11
1,716,598	Do. do. 4 % Deb. Stock Red.	100	4 %	4 %	4 %	4 %	100 —102	99½—101½	101	99½	— ½	3 18 10
179,313	Oriental Telep. and Elec. 1 to 171,504, fully paid ..	1	7 %	7 %	8 %	..	1⅝ — 1¾	1⅝ — 1¾	..	..	..	5 16 2
50,000	Do. do. do. 6 % Cum. Pref.	1	6 %	6 %	6 %	..	1¼ — 1½	1¼ — 1½	..	..	..	4 16 0
99,100	Do. do. do. 4 % Red. Deb. Stock ..	100	4 %	4 %	4 %	4 %	88 — 90	88 — 90	..	..	..	4 8 11
99,400	Pacific & European Tel., 4 % Guar. Debs., 1 to 1,000	10	4 %	4 %	4 %	4 %	100 —102	100 —102	..	..	..	3 18 5
11,889	Reuter's	8	5 %	5 %	5 %	..	7 — 8	7 — 8	..	..	..	5 0 0
99,100	Telephone Co. of Egypt, 4½ % Deb. Red.	100	4½%	4½%	4½%	4½%	99 —101	99 —101	..	..	..	4 9 1
8,068	Sulmarine Cables Trust	Cert.	6 %	6 %	6 %	6 %	127 —130	127 —130	..	..	..	4 12 4
100,000	United River Plate Telephone	5	8 %	8 %	8 %	..	6¾ — 7	6¾ — 7	6⅞	6⅝	..	5 14 3
40,600	Do. 5 % Cum. Pref., Nos. 1 to 40,000	5	5 %	5 %	5 %	5 %	4½ — 5⅛	4½ — 5⅛	..	..	..	4 13 0
80,008	W. Coast of America, 1 to 80,000 & 58,001 to 63,008	2½	Nil	2½%	2½%	..	1¼ — 1½	1¼ — 1½	..	..	..	4 3 4
150,000	Do. 4 % Debs., 1 to 1,500 guar. by Braz. Sub. Tel.	100	4 %	4 %	4 %	4 %	99 —101	99 —101	..	..	..	3 19 3
207,980	Western Telegraph, Ltd., Nos. 1 to 207,980.. ..	10	7 %	7 %	7 %	..	12⅜ — 13⅛	12⅜ — 13⅛	13⅛	12⅛	..	5 5 8
800,000	Do. do. 4 % Deb. Stock Red. ..	100	4 %	4 %	4 %	4 %	101 —103	101 —103	101½	..	..	3 17 6
86,321	West India and Panama Telegraph	10	Nil	Nil	Nil	Nil	⅜ — ⅝	7/16 — 9/16	..	..	— 1/16	Nil
84,663	Do. do. 6 % Cum. 1st Pref.	10	5 %	6 %	6 %	6 %	7⅝ — 8⅛	7⅝ — 8⅛	8	..	..	7 7 8
4,669	Do. do. 6 % Cum. 2nd Pref.	10	Nil	Nil	£2 6	..	7¼ — 8¼	7¼ — 8¼	..	..	..	2 14 1
80,000	Do. do. 5 % Debs., Nos. 1 to 1,800 ..	100	5 %	5 %	5 %	5 %	100 —102	100 —102	..	..	..	4 18 0

ELECTRICAL RAILWAY, MANUFACTURING AND INDUSTRIAL COMPANIES.

330,000	Anglo-Argentine Trams, 10 % Nom. Cum. 2nd Pref., 260,008 to 580,097	5	8 %	8 %	9 %	..	8⅞ — 9⅛	8 3/16 — 9 1/16	9 1/16	8 31/32	— 1/16	4 19 2
260,007	Do. 6 % Cum. Prefs., 1 to 260,007 ..	5	5⅛%	5⅛%	5⅜%	..	6⅛ — 6⅜	6⅛ — 6⅜	6⅜	..	..	4 10 0
266,600	Do. Permanent, 6 % Deb. Stock, 1888	100	6 %	6 %	6 %	6 %	137 —142	137 —142	..	..	..	4 4 6
285,100	Auckland E. Trams, 5 % 1st Mort. Deb. Stock ..	100	5 %	5 %	5 %	5 %	101 —103	101 —103	..	..	..	4 17 1
580,000	Babcock & Wilcox, 1 to 580,000	1	20 %	20 %	20 %	..	3⅞ — 4	3⅞ — 4	79/6	78/1½	..	5 0 0
100,000	Do. do. 6 % Cum. Pref., 1 to 100,000 ..	1	6 %	6 %	6 %	6 %	1 7/16 — 1 9/16	1 7/16 — 1 9/16	..	..	..	3 18 10
60,000	British Aluminium, Ord., 1 to 40,000	5	7 %	7 %	7 %	..	1⅞ — 2⅛	1⅞ — 2⅛	..	..	..	14 14 2
60,000	Do. do. 7 % Cum. Pref.	5	7 %	7 %	7 %	7 %	3⅜ — 3⅝	3⅜ — 3⅝	70/-	66/3	..	8 12 5
40,000	Do. do. "A" 6 % Cum. Pref. ..	5	6 %	6 %	6 %	6 %	3⅞ — 4⅛	3⅞ — 4⅛	..	..	..	7 1 2
12,897	Do. do. 4 % Funding Certs. ..	5	4 %	4 %	4 %	4 %	4⅛ — 4⅜	4⅛ — 4⅜	..	..	..	4 8 11
300,000	Do. do. 5½ % Loch Leven Debs. ..	100	..	5½%	5½%	5½%	98½—100½	98½—100½	94½	..	..	5 9 5
400,000	British Columbia E. Rail Def. Ord. Stock ..	100	6 %	6 %	8 %	8 %	135 —138	136 —139	1 8⅛	138	+1	5 15 1
400,000	Do. 5 % Pref. Ord. Stock	100	5 %	5 %	5 %	..	117 —121	117 —121	119½	118½	..	4 2 8
800,000	Do. 5 % Cum. Perp. Pref. Stock ..	100	5 %	5 %	5 %	5 %	106 —108	105½ - 107½	106	105½	— ½	4 13 0
288,000	Do. 4½ % 1st Mort. Debs., 1 to 6,250	40	4½%	4½%	4½%	4½%	102 —104	102 —104	..	..	..	10 15 5
220,000	Do. 4½ % Vancouver Power Debs., 1 to 2,200	100	4½%	4½%	4½%	4½%	101 —104	101 —104	..	..	..	4 6 7
133,301	British Electric Traction	10	3 %	Nil	Nil	..	1⅝ — 1 7/16	1⅝ — 1 5/32	20/-	18/9	— 3/9	Nil
161,457	Do. do. 6 % Cum. Pref.	10	6 %	6 %	8 %	..	3½ — 4	3½ — 4	..	..	..	7 0 0
1,478,678	Do. do. 5 % Perp. Deb. Stock ..	Stock	5 %	5 %	5 %	5 %	90 — 95	90 — 95	91½	91	..	5 5 3
528,986	Do. do. 4½ % 2nd Deb. Stock Red.	100	4½%	4½%	4½%	4½%	73 — 75	73 — 75	73½	..	..	6 0 1
100,000	British Insulated and Helsby Cables	5	8 %	10 %	10 %	..	6¾ — 7	6¾ — 7	6⅞	..	..	7 2 10
100,000	Do. do. 6 % Cum. Pref.	5	6 %	6 %	6 %	..	6¾ — 6¾	6¾ — 6¾	..	..	..	4 12 4
500,000	Do. do. 4½ % 1st Mort. Deb. Red...	100	4½%	4½%	4½%	4½%	103 —106	103 —106	..	..	..	4 4 11
208,440	British Thomson-Houston 4½ % 1st Mort. Debs. ..	100	4½%	4½%	4½%	..	91 — 96	91 — 96	..	..	..	4 13 9
400,000	British Westinghouse 6 % Pref., 1 to 200,000 and 275,001 to 475,000	5	Nil	Nil	Nil	..	⅜ — ⅝	⅜ — ⅝	..	..	..	Nil
1,016,858	Do. do. 4 % Mort. Deb. Stock ..	100	4 %	4 %	4 %	..	42 — 47	43 — 48	..	..	+1	8 6 8
50,000	Browett, Lindley & Co., Ord.	1	Nil	Nil	Nil	..	⅛ — ¼	⅛ — ¼	..	..	..	Nil
50,000	Do. do. 6 % Cum. Pref.	1	Nil	Nil	Nil	..	14/6 to 15/6	14/6 to 15/6	..	..	..	Nil
105,781	Brush Electrical Engineering, Ord., 1 to 105,781 ..	2	2½%	Nil	Nil	..	..	0 — ¼	..	..	..	Nil
150,000	Do. do. Non-cum. 6 % Pref.	2	6 %	Nil	Nil	..	..	1/16 — 1/8	..	..	..	Nil
125,000	Do. do. 4½ % Perp. Deb. Stock ..	Stock	4½%	4½%	4½%	..	59 — 64	59 — 64	..	..	—6	7 0 8
125,000	Do. do. 4½ % Perp. 2nd Deb. Stock..	Stock	4½%	4½%	4½%	..	38 — 42	38 — 42	..	..	—8	10 14 4
187,610	Calcutta Trams, 1 to 187,610	5	8 %	8 %	6 %	..	4¼ — 5	4¼ — 5	9/-	..	..	6 0 0
45,304	Do. 5 % Cum. Pref., Nos. 1 to 29,880..	5	5 %	5 %	5 %	5 %	4⅜ — 5⅛	4⅜ — 5⅛	..	..	+ ⅛	4 15 3
250,000	Do. 4½ % 1st Deb. Stock..	100	4½%	4½%	4½%	4½%	100 —103	100 —103	100⅛	..	..	4 7 5
85,000	Callender's Cable Construction shares	5	15 %	15 %	15 %	..	9 — 10	9 — 10	9⅛	9	..	7 10 0
40,000	Do. do. 5 % Cum. Pref.	5	5 %	5 %	5 %	..	5⅛ — 5⅜	5⅛ — 5⅜	..	..	..	4 6 11
800,000	Do. do. 4½ % 1st Mort. Deb. Stock Red.	Stock	4½%	4½%	4½%	4½%	106 —108	106 —108	..	..	..	4 3 4
491,222	Cape E Trams., 1 to 491,222	1	Nil	Nil	Nil	..	⅛ — ¼	⅛ — ⅜	..	..	..	Nil
450,000	Castner-Kellner Alkali, 1 to 450,000	1	6 %	8 %	12 %	..	1¼ — 1⅜	1⅛ — 1⅜	1 2/16	31/6	..	7 10 4
210,153	Do. do. 4½ % 1st Mort. Deb. Stock	100	4½%	4½%	4½%	..	103 —107	103 —107	..	..	..	4 5 11
1,198,610	Central London Railway, Ord. Stock	Stock	4 %	4 %	3 %	3½%	62 — 64	63 — 65	65	64½	..	4 13 9
558,195	Do. do. 4 % Pref. Stock	Stock	4 %	4 %	4 %	4 %	84 — 86	85 — 87	85	..	+1	4 12 0
558,195	Do. do. Def. do.	Stock	4 %	4 %	2 %	2½%	49 — 51	50 — 52	53	50½	..	3 18 5
1,480,000	City and South London Railway	Stock	1½%	2½%	2½%	1½%	28½ — 29½	28 — 29	28⅝	28½	— ⅛	5 3 6
60,000	Crompton & Co., Nos. 1 to 60,000	5	2½%	5 %	5 %	..	1½ — 1¾	1½ — 1½	..	..	..	10 0 0
100,000	Do. 5 % 1st Mort. Reg. Debs., 1 to 900 of £100, and 901 to 11,500 of £50 Red.	..	5 %	5 %	5 %	5 %	96 — 99	96 — 99	..	..	..	5 1 0

* Unless otherwise stated, all shares are fully paid † A period of nine months. ‡ From Manchester Share List.

Continued on next page.

SHARE LIST OF ELECTRICAL COMPANIES.—(*Continued.*)

ELECTRICAL RAILWAY, MANUFACTURING AND INDUSTRIAL COMPANIES.—(*Continued*)

Present Issue.	NAME.	Stock or Share.	Dividends for the last four years. 1905.	1906.	1907.	1908.	Closing Quotations Jan. 19th.	Closing Quotations Jan. 26th.	Business done week ended Jan. 26th, 1909. Highest	Lowest.	Rise + or Fall —	Present Yield per cent. £ s. d.
260,000	Dick, Kerr & Co., 1 to 260,000	1	10 %	10 %	10 %	..	1⅜ — 1⅝	1⅜ — 1⅝	..	..	..	7 12 5
305,000	Do. do. 6 % Cum. Pref., 1 to 305,000	1	6 %	6 %	6 %	..	1⅛ — 1⅜	1⅛ — 1⅜	22/6	..	..	5 1 1
276,880	Do. do. 4½ % Deb. Stock	100	4½%	4½%	4½%	4½%	99 —102	99 —102	..	..	..	4 8 3
50,000	Dublin United Trams. (1896), 1 to 50,000	10	6%	6 %	6½%	..	11¾ — 12¼	11¼ — 12¼	..	..	..	5 4 0
50,000	Do. 6 % Pref. between 1 and 50,000	10	6 %	6 %	6 %	6 %	13 — 14	13 — 14	..	..	..	4 5 9
99,361	Edison & Swan Utd., "A" shs., £8 pd., 1 to 99,361	5	4½%	4½%	4½%	..	⅞ — 1	⅞ — 1	..	..	..	16 15 3
17,139	Do. "A" shares, 01—017,139	5	4½%	4½%	4½%	..	1⅛ — 2⅛	1⅛ — 2⅛	..	..	..	8 6 9
817,875	Do. 4 % Deb. Stock Red.	100	4 %	4 %	4 %	4 %	73 — 78	75 — 78	..	..	..	5 2 7
67,730	Do. 5 % 2nd Deb. Stock Prov. Certs. all pd.	100	5 %	5 %	5 %	..	86 — 89	86 — 89	..	..	..	5 12 4
112,100	Electric Construction, 1 to 112,100	2	Nil	Nil	Nil	Nil	⅛ — ¼	⅛ — ¼	..	..	..	Nil
31,890	Do. do. 7 % Cum. Pref., 1 to 31,890	2	7 %	7 %	7 %	7 %	1½ — 1¾	1½ — 1¾	..	..	+ ⅛	9 6 9
35,000	General Electric Co, (1900), 5 % Cum. Pref.	10	5 %	5 %	5 %	..	7 — 7⅛	7 — 7⅛	..	..	..	6 13 4
200,000	Do. do. 4 % Mort Deb.	Stock	4 %	4 %	4 %	4 %	85 — 89	85 — 89	..	..	..	4 9 11
78,000	Gt. N. & City Rail. Pref. Ord. "A" 4 %, 1 to 78,000	10	4 %	4 %	4½%	..	⅛ — ¼	⅛ — ¼	..	..	..	6 13 4
96,000	Greenwood & Batley, 7 % Cum. Pref.	10	7 %	7 %	7 %	..	10¼ — 10¾	10¼ — 10¾	..	..	..	6 10 3
80,000	Do. do. 5 % Mort. Debs.	100	5 %	5 %	5 %	5 %	102 —103	102 —103½	..	..	..	4 16 10
40,000	Henley's (W. T.), Telegraph Works, Ord.	5	15%	5 %	15%	..	11⅜ — 12⅜	11⅜ — 12⅜	11⅜	..	..	5 17 8
40,000	Do. do. 4½ % Pref.	5	4½%	4½%	4½%	..	5 — 5½	5 — 5½	6⅛	..	..	4 1 10
150,000	Do. do. 4½ % Mort. Deb. Stock	Stock	4½%	4½%	4½%	4½%	105½ —107⅛	105¼ —107⅛	..	..	..	4 3 9
50,000	India-Rubber, Gutta-percha & Telegraph Works.	10	10%	0 %	10 %	..	15⅜ — 16⅜	15⅛ — 16⅛	15 11/16	..	..	6 1 3
37,500	†Liverpool Overhead Railway, Ord.	10	Nil	Nil	⅜	..	1 — 1⅛	⅝ — ¾	..	..	— 5/32	5 6 8
10,000	† Do. do. Pref., fully paid	10	5 %	5 %	5 %	..	4 — 4½	4 — 4½	..	..	..	11 2 2
600,070	London United Trams. (1901), 1 to 50,007	10	3 %	3 %	3 %	..	6¼ — 6⅝	6¼ — 6⅝	..	..	..	4 8 11
999,980	Do. do. 60,008 to 100,000	10	3 %	3 %	3 %	..	6¼ — 6⅝	6¼ — 6⅝	..	..	..	4 8 11
125,000	Do. do. 5 % Cum. Pref., 1 to 125,000	10	5 %	5 %	5 %	..	3¾ — 4	3¾ — 4⅛	77/6	..	+ ⅜	11 15 4
1,321,000	Do. do. 4 % 1st Mort. Deb. Stock	100	4 %	4 %	4 %	4 %	67 — 71	69 — 73	70	..	+ 2	5 9 7
5,722,062	Metropolitan Consolidated	100	2⅜%	1 %	¾%	¾%	35½ — 37½	36 — 37	37 3/16	36⅜	..	1 6 8
2,540,914	Do. Surplus Lands	100	2⅜%	2⅜%	2⅜%	2⅜%	70 — 72	70 — 72	72	70⅜	..	3 16 5
3,235,000	Do. District	100	Nil	Nil	Nil	Nil	12½ — 14	13½ — 14½	14⅛	13 1/16	+ ½	Nil
314,016	Metropolitan Electric Trams., Defd.	1	Nil	Nil	Nil	..	⅝ — ¾	⅝ — ¾	..	..	..	Nil
600,000	Do. do. 5 % Cum. Pref.	1	5 %	5 %	5 %	..	⅝ — ¾	⅝ — ¾	..	..	..	5 19 5
823,800	Do. do. 4½ % Deb. Stock Red.	100	4½%	4½%	4½%	4½%	92 — 95	93 — 95	..	..	+ 1	4 13 9
$6,000,000	Mexico Trams Co., Common Stock	..	..	..	..	..	144 —147	140 —143	145½	142½	..	..
$9,000,000	Do. 1st Mort. 50-year £% Gld. Bds.	..	..	..	..	..	92 — 93	92 — 93	93	92½	..	..
245,500	Potteries E. Tro.	1	4 %	4 %	4 %	..	⅞ — 1	⅞ — 1	..	..	..	8 0 0
245,500	Do. 5 % Cum. Pref.	1	5 %	5 %	5 %	..	1 — 1⅛	1 — 1⅛	..	..	..	6 17 11
245,000	Do. 4½ % Deb. Stock	100	4½%	4½%	4½%	4½%	90 — 93	90 — 93	..	..	..	4 14 9
87,350	Telegraph Construction and Maintenance	12	15 %	5 %	17½%	..	31½ — 33½	32 — 34	33½	32½	+ ½	7 0 0
150,000	Do. 4 % Deb. Bds., 1 to 1,500 Red., 1909	100	4 %	4 %	4 %	4 %	99 —102	99 —102	..	..	..	3 18 5
1,000,000	Underground Electric Railway, 5% Prior Lien	..	..	..	..	..	98 — 99	98½ — 99½	99½	98½	+ ½	..
2,800,000	Do. do. 4½% Bonds	..	..	..	..	4½%	78 — 80	82 — 84	84⅛	79⅝	+4	..
4,900,000	Do. do. 6% Income Bonds	..	..	..	..	..	24 — 26	26 — 28	27⅝	26½	+2	..
66,666	Willans & Robinson, 1 to 80,000 & 80,001 to 116,666	1	Nil	Nil	10 %	..	⅜ — ½	⅜ — ½	..	..	..	10 0 0
66,666	Do. 6 % C.P., 80,001 to 80,000 & 126,001 to 141,666	5	Nil	..	6 %	..	2⅜ — 2⅝	2⅜ — 2⅝	..	..	..	10 8 8
216,404	Do. 4 % 1st Mort. Deb. Stock	..	4 %	4 %	4 %	4 %	68 — 72	68 — 72	..	..	..	5 11 1

ELECTRICITY SUPPLY COMPANIES.

15,000	Bromley (Kent) E.L. & P., 1 to 15,000	5	5½%	5½%	5½%	..	4½ — 5	4½ — 5	..	..	..	5 10 0
70,000	Do. do. 4½ % 1st. deb. stock	100	4½%	4½%	4½%	4½%	94 — 98	94 — 98	..	..	..	4 10 0
30,275	Brompton & Kens. Elec. Lt. Sup., Ord., 1 to 20,000	5	10 %	10%	10 %	..	8½ — 9	8⅝ — 8⅞	8	..	— ⅛	5 12 8
9,725	Do. do. 7 % Cum. Pref.	5	7 %	7 %	7 %	..	8 — 8½	8 — 8⅛	..	..	..	4 2 4
836,876	Central Electric Supply 4 % Guar. Deb. Stock	100	4 %	4 %	4 %	4 %	98 — 101	98 —101	..	..	..	3 19 3
80,000	Charing Cross and Strand Electricity Supply	5	5 %	5 %	5 %	..	4⅜ — 4⅞	4⅜ — 4⅞	95/-	90/7½	..	5 2 7
80,000	Do. do. do. 4½ % Cum. Pref.	5	4½%	4½%	4½%	..	4⅛ — 4⅜	4⅛ — 4⅜	86/3	83/9	..	4 17 4
80,000	Do. "City Undertaking" 4½ % Cum. Prf.	5	4½%	4½%	4½%	..	3¾ — 4⅛	3¾ — 4⅛	..	..	..	5 5 11
445,736	Do. do. 4 % Deb. Stock Red.	100	4 %	4 %	4 %	4 %	96 — 98	96 — 98	97½	..	..	4 1 8
49,486	Chelsea Electricity Supply, Ord.	5	6 %	4½%	4½%	..	3¾ — 4⅛	3¾ — 4⅛	80/-	79/4½	..	5 5 11
175,000	Do. do. 4½ % Deb. Stock Red.	Stock	4½%	4½%	4½%	4½%	102 —105	102 —105	..	..	..	4 5 9
70,595	City of London Elec. Lighting, Ord. 40,001—110,595	10	6 %	6 %	6 %	..	10⅜ — 11½	10⅜ — 11	10 23/32	10 23/32	— ⅛	5 6 8
40,000	Do. 6 % Cum. Pref., 1 to 40,000	10	6 %	6 %	6 %	..	12 — 12½	12 — 12⅝	12⅝	12½	+ ⅛	4 14 1
400,000	Do. 5 % Db. Stk., Scrip. (iss. at 115) all pd.	..	5 %	5 %	5 %	5 %	121 —123	121 —123	..	..	..	4 1 4
300,000	Do. 4½ % 2nd. Db. Stk., Prov. Crts., all pd.	100	4½%	4½%	4½%	4½%	99 —101	99 —102	101½	..	+ ⅛	4 8 3
50,000	County of Durham Electrical Power, Ord.	5	4 %	4 %	2 %	..	2½ — 3	2½ — 3	..	..	..	3 6 8
50,000	Do. do. do. 5 % Pref.	5	5 %	5 %	5 %	..	3¾ — 4	3¾ — 3⅞	..	..	— ⅛	6 13 4
250,000	Do. do. do. 5 % 1st Mtg. Deb.	Stock	..	..	..	5 %	96 — 98	96 — 98	..	..	..	..
40,000	County of London Electric Lighting, Ord. 1—40,000	10	5 %	5 %	5 %	..	8⅞ — 9½	8⅞ — 9½	..	..	..	5 8 1
50,026	Do. do. 6 % Pref., 40,001—60,000	10	6 %	6 %	6 %	..	10⅝ — 11½	10⅝ — 11½	11 1/16	10½	+ ⅛	5 6 8
400,000	Do. do. 4½ % Deb. Stock	..	4½%	4½%	4½%	4½%	105 —108	105 —108	105½	..	..	4 3 4
400,000	Do. do. 4½ % 2nd. Deb. Stock	Stock	4½%	4½%	4½%	4½%	100 —103	100 —103	..	..	..	4 7 5
80,000	Edmundson's Electric Corporation, Ord. Shares	5	4 %	Nil	Nil	..	1/16 — ⅛	1/16 — ⅛	..	..	..	Nil
80,000	Do. do. 6 % Cum. Pref.	5	6 %	3 %	Nil	..	⅛ — ¼	⅛ — ¼	..	..	..	Nil
430,500	Do. do. 4½ % 1st Mort. Deb. Stk.	100	4½%	4½%	4½%	4½%	59 — 62 xd	59 — 62	..	..	..	7 0 8
$8,150,000	Electrical Dev. Co. of Ontario, 5% 1st Mtg. Gold Bnds.	$500	..	..	..	..	84 — 86	85 — 87	86½	85½	+1	..
10,000	Folkestone, 1 to 10,000	5	5½%	5½%	5½%	..	4⅜ — 5½	4⅜ — 5½	..	..	..	5 4 9
10,000	Do. 5 % Cum. Pref., 1 to 10,000	5	5 %	5 %	5 %	..	5 — 5½	5 — 5½	..	..	..	4 10 0
90,000	Do. 4½ % 1st Deb. Stock	100	4½%	4½%	4½%	4½%	95 — 98	95 — 98	..	..	..	4 11 10
15,000	Hove, 1 to 15,000	5	9 %	9 %	8½%	..	6⅜ — 6⅞	6⅜ — 6⅞	..	..	..	6 8 8
$1,325,000	Kaministiquia Power Co., 5 % Gold Bnds.	..	..	..	..	5 %	95 — 96	96 — 97	96½	96⅛	+1	5 3 1
31,000	Kensington and Knightsbridge Electric Ord.	5	10 %	10 %	10 %	..	7⅞ — 8⅛	7⅞ — 8⅛	..	..	..	6 1 3
90,000	Do. do. do. 4 % Deben. Stk.	Stock	4 %	4 %	4 %	4 %	95 — 98	95 — 98	97	..	..	4 1 8
111,000	London Electric Supply Corporation, Limited, Ord.	3	4 %	4 %	2½%	..	1⅜ — 1⅝	1⅜ — 1⅝	..	..	..	3 6 8
70,000	Do. do. do 6 % Pref.	5	6 %	6 %	6 %	..	4⅛ — 5⅛	4⅛ — 5⅛	..	..	..	5 14 3
874,395	Do. do. 4 % 1st Mort. Deb. Stk. Red.	Stock	4 %	4 %	4 %	4 %	89 — 93	89 — 93	..	..	..	4 16 9
200,000	Metropolitan Electric Supply, 1 to 100,000	5	10 %	8 %	6½%	..	4⅜ — 5⅛	4⅜ — 5⅛	101/3	95/7½	— ⅛	6 6 10
75,121	Do. 4½ % Cum. Pref. 1—71,106	5	4½%	4½%	4½%	..	4⅛ — 5	4⅛ — 5	93/9	91/3	..	4 10 0
730,000	Do. 4½ % 1st Mort. Deben. Stock	..	4½%	4½%	4½%	4½%	105 —108	105 —108	..	..	..	4 3 4
348,000	Do. 3¼ % Mort. Deben. Stock Redeem.	Stock	3¼%	3¼%	3¼%	3¼%	85 — 88	85 — 88	..	..	..	3 19 7
$6,000,000	Mexican Electric Light Co., 5% 1st Mtg. Gold Bnds	..	5 %	5 %	5 %	5 %	87 — 88	87 — 88	88½	87½	..	5 13 8
13,585,000	Do. Light and Power Co., Ltd., Common	$100	..	..	..	..	88 — 90	85 — 87	90⅜	88¾	—3	..
$1,500,000	Do. do. 7% Cum. Pref. Stk.	Stock	..	..	..	..	113 —115	112¼ —114½	114¾	113	— ½	..
$12,000,000	Do. do. 5% 1st Mtg. Gold Bnds.	..	..	..	..	5 %	93 — 94	93¼ — 94	94	92½	— ⅝	5 6 11
250,000	Midland Electric Corporation, 4½ % 1st Mort. Deb.	100	4½%	4½%	4½%	4½%	93 — 96	95 — 98	96	..	+ ⅜	4 11 10
87,500	Newcastle-on-Tyne, 1 to 87,500	5	8 %	8 %	6 %	..	4½ — 5	4½ — 4⅝	92/6	..	— ⅛	£ 8 5
87,500	Do. 5 % Pref., 1 to 87,500	5	5 %	5 %	5 %	..	5 — 5⅛	5 — 5⅛	5	..	..	4 10 11
126,500	North Metropolitan Electric Power Supply Co., 5 % Mortgages (Red.), Nos. 1 to 1,265	100	..	..	..	..	100 —102	100 —102	..	..	..	..
16,852	Notting Hill Electric Lighting	10	7½%	7½%	7½%	..	11½ — 12½	11½ — 11⅝	..	..	..	6 5 0
20,000	Oxford, 1 to 96 and 407 to 20,310	5	7 %	7 %	7 %	..	5⅛ — 6⅜	5⅛ — 6⅜	..	..	..	5 9 10
50,000	Do. 4 % Deb. Stock	100	4 %	4 %	4 %	4 %	94 — 97 xd	94 — 97	..	..	..	4 1 8
119,691	River Plate Elcty. Co. Ord. Nos. 1 to 120,507	1	..	2½%	..	..	1⅜ — 1½	1⅜ — 1⅝	24/-	..	..	..
100,000	Do. do. 6% Non Cum. Pref. Nos. 1 to 100,000	1	6	6	6	..	1⅜ — 1⅝	1⅜ — 1⅝	21/3	..	..	..
194,684	Do. do. 5% Deb. Stk. Red.	100	5	5	..	5 %	99 —102	99 — 102	..	..	..	4 18 0
40,000	St. James' and Pall Mall Electric Light, Ord.	5	12½%	10 %	10 %	..	8⅝ — 9⅛	8⅝ — 9⅛	8⅝	..	..	5 9 7
20,000	Do. do. 7 % Pref. 20,001 to 40,000	5	7 %	7 %	7 %	..	6⅞ — 7⅛	6⅞ — 7⅛	7	..	..	4 16 7
160,000	Do. do. 3½ % Deb. Stock Red.	100	3 %	3½%	3½%	3½%	86 — 90	86 — 90	..	..	..	3 17 9
12,000	Smithfield Markets Electric Supply, Ord.	5	4 %	Nil	Nil	..	1/16 — ⅛	1/16 — 1/8	..	..	..	Nil
45,700	Do. do. do. 4 % Deb. Stock	Stock	4 %	4 %	4 %	4 %	68 — 72	68 — 72	..	..	..	5 11 1
65,000	South London Electricity Supply, Ord.	4	4 %	3 %	4 %	..	2¼ — 2⅜	2¼ — 2⅜	50/-	..	..	6 10 4
120,000	South Met. Elec. Lt. & Power, Ord.	1	2½%	2½%	2½%	..	⅜ — ½	⅜ — ½	..	..	..	3 6 8
142,968	Do. do. 7 % Pref.	1	7 %	7 %	7 %	..	1⅜ — 1⅝	1⅜ — 1⅝	..	..	..	5 16 8
200,000	Do. do. 4½ % 1st Deb. Stk.	100	4½%	4½%	4½%	4½%	100 —103	100 —103	..	..	..	4 7 5
80,000	Urban Electric Supply, Ord.	5	5 %	5 %	5 %	..	¾ — 1	¾ — 1	..	..	..	20 0 0
80,000	Do. do. 5 % Cum. Pref.	5	5 %	5 %	5 %	..	1⅝ — 2	1⅝ — 2	32/6	..	..	12 10 0
275,000	Do. do. 4½ % 1st Mort. Db. Stk. Red.	100	4½%	4½%	4½%	4½%	80 — 83	80 — 83	..	..	..	5 8 5
800,000	Victoria Falls Power Co., Pref. Nos. 1 to 800,000	1	..	..	..	..	⅜ — ½	13/32 — 15/32	16/3	15/7½	— 1/16	..
110,000	Westminster Electric Supply, Ord.	5	13 %	12 %	10 %	..	8⅜ — 8¾	8⅜ — 8⅝	8 1/16	8⅛	..	5 11 1
81,979	Do. do. 4½ % Cum. Pref. Reduced from 5% since 31st Dec., 1905)	5	5 %	4½%	4½%	4½%	5⅛ — 5⅜	5⅛ — 5⅜	5 1/16	..	..	4 1 10

* Unless otherwise stated, all shares are fully paid. † Quotations on Liverpool Stock Exchange. ‡ Interim Dividend.

Bank rate of Discount, 3 per cent., January 14th, 1909

SOME SIEMENS ELECTRICAL AND OTHER INSTRUMENTS.

WE recently paid a visit to the Woolwich works of Messrs. Siemens Bros. & Co., Ltd., for the purpose of inspecting their instrument-making department, which has been largely reorganised and greatly improved. The magnitude of Messrs. Siemens's operations in this connection is not, perhaps, so generally known as in the case of their heavy machinery and cables, partly, no doubt, because much of their output is supplied to the Admiralty and other Government Departments.

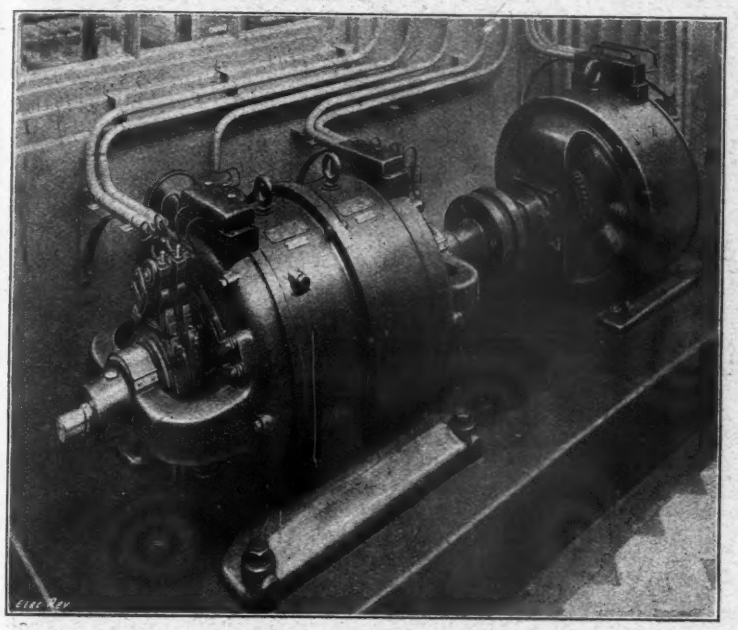

FIG. 1.—DOUBLE A.C. GENERATOR FOR TESTING WATTMETERS, &c., AT VARIOUS POWER FACTORS.

We were particularly interested in the A.C. instrument-testing department, which combines facilities for a wide range of work with simplicity and convenience of operation. Ammeters reading from 0·01 to 300 amperes are permanently fixed on a board in front of the operator, and can be brought into use individually with a multiple-way switch; voltmeters and wattmeters are also provided, and when it is necessary to read the current and pressure in each phase simultaneously, two similar sets of instruments are available for the purpose. Coarse and fine current regulators are provided, and variable-voltage transformers are used for adjusting the pressure in each phase. Several circuits are fitted on the testing table.

The method adopted for obtaining various power factors, and for testing wattmeters at all loads without waste of power, is of special interest; a D.C. motor is mechanically coupled to two A.C. generators, as shown in the accompanying illustration, one of which feeds the pressure circuits and the other the current circuits. The field-magnets of both generators are controlled by rheostats at the testing table, and the D.C. motor is supplied with power from a set of accumulators having a capacity of 240 ampere-hours at 500 volts, so that a constant speed can be maintained over a long period. The speed of the motor is controlled by field regulation, giving a range of frequency from 20 to 120 cycles per second. The stator of one of the generators is mounted so as to be capable of rotation through an angle of about 100°, the movement being effected by means of a small motor driving through worm gear, and thus it is possible to produce any desired phase angle between current and pressure, giving a range of power factor from zero to unity with infinitesimal gradations. This operation is controlled entirely from the testing table, the motor-generator requiring no attention. Wattmeters are required not only to give correct indications at all loads within their range at usual values of the power factor, but also to read absolutely zero when supplied with the maximum current and pressure at zero power factor—a very severe test.

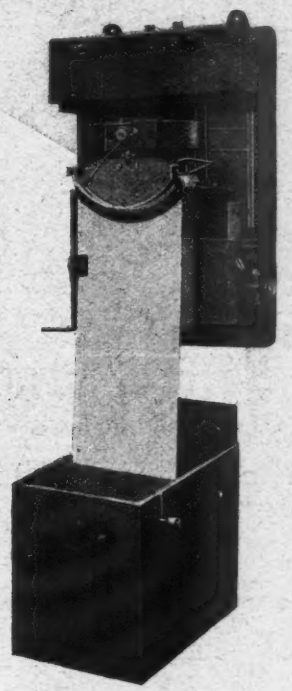

FIG. 5.—SPARK RECORDER.

FIG. 2.—A.C. TIME LIMIT RELAY.

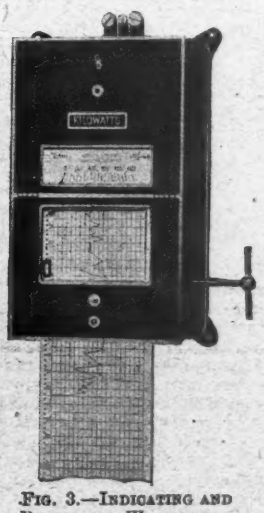

FIG. 3.—INDICATING AND RECORDING WATTMETER.

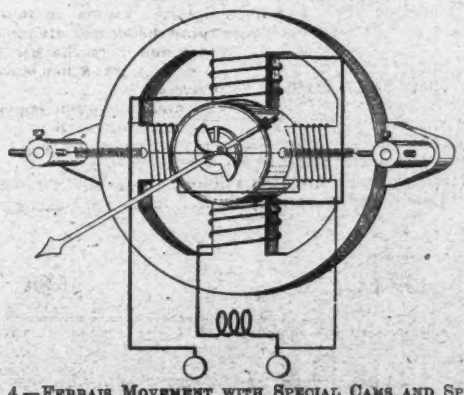

FIG. 4.—FERRARIS MOVEMENT WITH SPECIAL CAMS AND SPRING CONTROL TO GIVE PROPORTIONALITY.

The convenience of the arrangement has commended itself to the authorities of the National Physical Laboratory so far that the latter have ordered a motor-generator set of the type described.

One of the instruments under test at the time of our visit was a new time-limit relay for alternating current, which is illustrated in fig. 2; this is a neat device of the Ferraris motor type, and is provided with convenient means for adjusting both the maximum current and the time limit from the outside of the case. The Ferraris principle has been employed in other Siemens instruments, as, for example, the combined indicating and recording wattmeter, which we illustrate in fig. 3. This has a patent link motion which gives a rectilinear movement to the pen, instead of

the usual curved path, and by means of the special arrangement of controlling springs and cams shown in fig. 4, the divisions are made practically proportional, so that the record on the chart can be integrated with a planimeter. The chart is 60 ft. long, and the clock runs for eight days, thus reducing the attendance required to a minimum. When it is desired to use these wattmeters on unbalanced polyphase loads, two movements are provided, electrically independent but mechanically coupled through a common spindle, so that the true power is recorded.

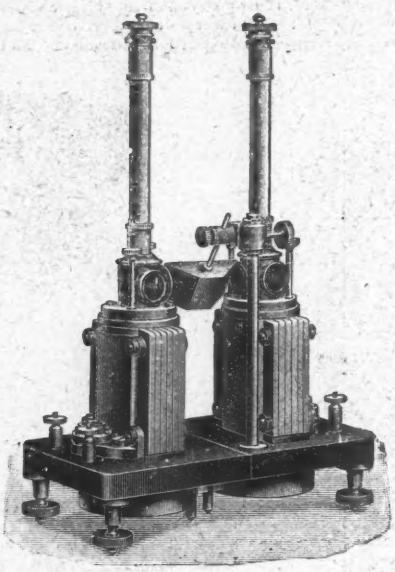

FIG. 6.—SALADIN DOUBLE GALVANOMETER.

In another type of recorder the pointer carries not a pen, but a marking point under a curved metal bar, which at regular intervals strikes the point against the paper and marks the back of the latter by means of an inking ribbon, the record being visible through the paper. A further improvement is shown in fig. 5, the "spark recorder"; here the pointer is not touched by the metal bar above-mentioned, but instead a spark from an induction coil passes from the bar to the marking point and through the paper to a plate at the back of the latter, thus making an indelible record, absolutely without friction. This type of instrument, which is made practically dead-beat, is especially suitable for experiments and tests in which the current varies rapidly. The chart is 150 ft. long and moves at the rate of 12 cm. per minute.

Besides the foregoing A.C. instruments, D.C. instruments are, of course, made by Messrs. Siemens Bros., as well as laboratory and workshop apparatus. An interesting device is the Saladin galvanometer, illustrated in fig. 6. This consists of two moving-coil galvanometers optically coupled by a reflecting prism, in such a way that the horizontal motion of the pencil of rays from the mirror of the one galvanometer is converted into a vertical motion; the pencil is then reflected from the mirror of the second galvanometer, and the vertical motion being thus combined with the horizontal motion of the latter, the "spot" describes a plane figure on the screen. Thus closed curves can be produced, representing hysteresis cycles, and similar cyclical relations between two variable factors represented by current or pressure. The apparatus can be used for any speed of the spot up to 2·5 mm. per second, and the curve can be photographed with plates of ordinary sensitiveness.

An interesting device of quite a different order is the Hopkinson-Thring patent torsion meter, which is being manufactured by

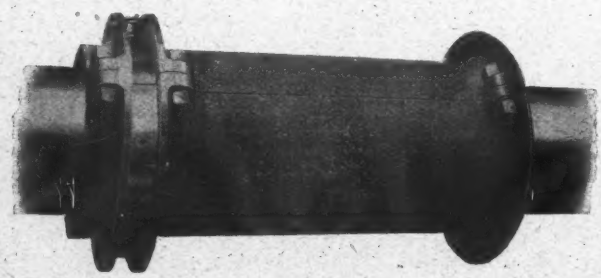

FIG. 7.—HOPKINSON THRING TORSION METER.

Messrs. Siemens Bros. This, of course, has special application to turbines, but can be used for measuring the power transmitted through any shaft. It takes up but a short length of shaft, is extremely compact and strong, and gives a direct reading of the torsion on the shaft. The principle of the instrument depends upon the observation of the relative motion between two rays of light projected upon a scale from mirrors, which revolve with the shaft and throw a practically continuous line of light across a scale, even at moderate speeds.

One mirror is fixed relatively to the shaft, while the other is deflected proportionately to the torsion between two points on the shaft at a fixed distance apart, and the distance between the two lines of light is a measure of the torsion in that length of shaft. Fig. 7 shows the torsion meter, and fig. 8 the scale box used in connection with it. The torque mirror is double, so that a reflection is received from each side of it during a revolution; these reflections are on opposite sides of the zero, and should both be equally distant from the latter. When the shaft is at rest and free from torsion, the two reflections combine, and should coincide with that from the zero mirror. Provision is made for facilitating these adjustments. The instrument is best calibrated in position by direct torsion of the shaft before the latter is coupled up, and the constant being thus ascertained, the horse-power can be calculated from the reading and speed to within a small percentage. This instrument has been largely adopted, with satisfactory results.

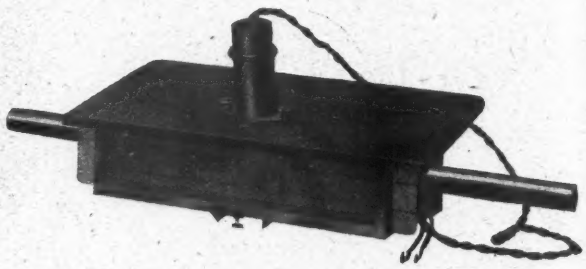

FIG. 8.—SCALE BOX FOR TORSION METER.

Turning to the subject of pyrometry, it will not be surprising, seeing that the water pyrometer was invented by Sir Wm. Siemens, that Messrs. Siemens Bros. & Co. are specialists in this art. The water pyrometer, much improved, is still largely used, and the firm make a great many such instruments; but the modern electrical methods are so much superior in many respects, that their universal adoption is only a question of time. Besides the original pattern of resistance pyrometer, Messrs. Siemens make thermo-electrical and optical types.

The measurement of resistance in the case of the first is simplified by the use of a direct-reading instrument, combining a galvanometer with a slide-wire bridge, and giving the temperature on a scale graduated in degrees F. or C. This apparatus, the simplest and most robust of electrical pyrometers, is much used in steel works, gun factories, &c., and is essentially identical with that devised by Sir William Siemens in 1860 or thereabouts.

By a natural extension of the system, it has been applied also to the determination at a central point of the temperatures of cold storage rooms, &c., and similar purposes. The thermo-electrical pyrometer can readily be made direct reading on a graduated scale, and the firm have developed a variety of indicators and recorders to be used in conjunction with their thermo-couples; we illustrate (fig. 9) an indicator of the moving-coil wall pattern,

FIG. 9.—WALL-PATTERN INDICATOR FOR THERMO-ELECTRICAL PYROMETER.

reading to any desired scale of temperature, and provided also with a scale of millivolts. Another illustration (fig. 10) shows a temperature recorder based upon similar principles, and capable of use, in conjunction with an automatic time switch, for recording the temperatures of five points at short intervals.

The most interesting pyrometer, however, is the optical type, illustrated in fig. 11. In this instrument the temperature of the filament of an incandescent lamp, viewed in the field of a telescope simultaneously with the interior, say, of a furnace, is adjusted until the colour of the filament merges into that of the furnace; the temperature is then read off the scale of a millammeter. The simplicity and ease with which the measurement can be made, and the accuracy with which it can be repeated, are surprising. The lamp current is regulated by a rheostat mounted on the apparatus as shown, current being supplied by a small storage battery. Should the temperature of the furnace be greater than that to which the filament can safel be subjected, a light-absorption device is employed, which greatly extends the range of the instrument. Both the lamps used and the screens are standardised and are accompanied by an official certificate. The only drawback to this convenient method of measurement is the fact that it cannot be employed below 600° C. It is being widely used in steel works, &c., and special patterns are being prepared for such industrial uses.

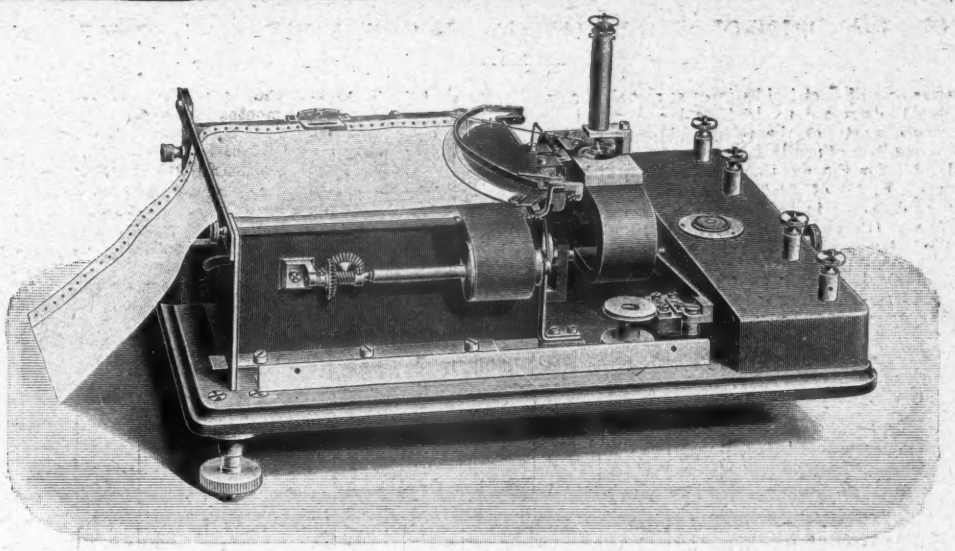

Fig. 10.—Siemens Temperature Recorder.

Lastly, Messrs. Siemens Bros. have introduced a series of motor horns actuated by electricity, on the principle described in our issue of October 9th last, p. 581. These horns give a loud, clear note, which can be sustained for any length of time. We have

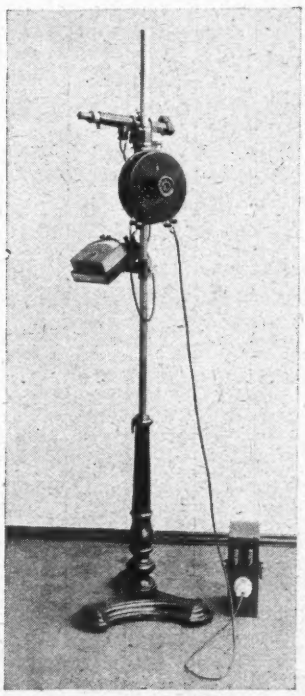

Fig. 11.—Siemens Optical Pyrometer.

our own views as to the musical amenities or otherwise of motor horns in general, but as to the efficiency and dispersive power of the electric horn we have no doubt whatever.

Wireless Telegraphy.—The practical value of the Marconi system in saving life at sea was admirably demonstrated on Sunday morning last, when, by its means, aid was summoned carrying some 2,000 lives, after their collision in dense fog off the from all directions to the sinking *Republic* and the damaged *Florida*, American coast. The *Republic* alone was fitted with Marconi apparatus, and the operator, named Jack Binns, calmly stuck to his post and telegraphed continuously for 14 hours until the supply of current failed, first through the flooding of the dynamos, and afterwards the exhaustion of the storage batteries. When the rescuers approached the disabled vessels, and other means of communication failed, their position was signalled by means of submarine bells, the signals being received by microphones. Thus electricity played a most responsible and indispensable part in the rescue of so many persons.

AMERICAN CENTRAL STATIONS.

From our friend, Mr. T. Commerford Martin, Special Agent for Electrical Industries in the Department of Commerce and Labour, Washington, we have received a copy of the figures just published by the Bureau of the Census as a preliminary statement of the central-station industry in the United States for 1907. We understand that it will probably be some months before Mr. Martin is able to issue the full text and final report. He is also working at present on the electric railway, telephone and telegraph statistics for the same year. The statement is as follows:—

January 12th, 1909.

Continental United States

(*Exclusive of Alaska, Hawaii, Philippine Islands, and Porto Rico.*)

The statistics relate to the years ending December 31st, 1907, and June 30th, 1902. The totals include central stations only. They do not include isolated plants, or plants that were idle or in course of construction, and in but few instances plants operated by electric railway companies.

	1907.	1902.	Per cent. increase.
No. of establishments ...	4,714	3,620	30·2
Commercial	3,462	2,805	23·4
Municipal	1,252	815	53·6
Total cost of plants ...	$996,613,622	$504,740,352	97·5
Total income*	$175,642,338	$85,700,605	104·9
Lighting service ...	$125,755,114	$70,138,147	79·3
All other elecl. service	$43,859,577	$14,048,458	212·2
All other sources ...	$6,027,647	$1,514,000	298·1
Total expenses	$134,196,911	$68,081,375	97·1
Salaried employés:			
Number	12,990	6 996	85·7
Salaries	$11,733,787	$5,663,580	107·2
Wage-earners:			
Average number ...	34,642	23,330	48·5
Wages	$23,686,537	$14,983,112	58·1
Supplies, materials & fuel	$14,458,568	$22,915,932	94·0
All other expenses (including int. on bonds)	$54,318,019	$24,518,751	121·5
Steam and gas engines (including turbines):			
Number	7,674	6,095	25·9
Horse-power	2,684,228	1,392,122	92·8
Water-wheels:			
Number	2,474	1,390	78·0
Horse-power	1,347,487	438,472	207·3
Total kilowatt capacity of dynamos	2,642,403	1,218,735	116·8
Output of stations, total kw.-hours	5,858,121,860	2,507,051,115	133·7
Estimated number of lamps wired for service:			
Arc lamps	†555,921	385,698	44·1
Incandescent lamps ...	†41,507,944	18,194,044	129·8
Stationary motors served:			
Total h.p. capacity ...	1,649,026	438,005	276·5

* Exclusive of income for current used for light and power that was furnished by railway companies, and which is included in the report for street and electric railways.

† Exclusive of lamps used by the establishments reporting to light their own properties.

The final report will contain an analysis of the above totals, and present detail statistics by States, and for other phases of the industry.

EXPORTS AND IMPORTS OF ELECTRICAL GOODS DURING DECEMBER, 1908.

The December returns of electrical business as regards the exports, show a considerably decreased total. This, however, is solely due to the fluctuating character of the telegraphic section, which last month included one item of nearly £100,000.

The actual total for the month was £257,511, which compares with the November total of £336,100; and if telegraphic cable and material are deducted in both cases, the figures are (November) £214,377, and (December) £220,241, showing an improvement during the latter month in general business.

The imports show a substantial increase, the total amounting to £174,453, as against £144,163 in the previous month; the re-exports also show an increase, the total of £14,512 being some £3,000 in excess of the November value. Incidentally, it may be mentioned that both the exports and imports are considerably above the average of the first nine months of the year.

Of the individual items, the electrical machinery and cable exports were slightly in excess of the previous month's totals; telegraphic exports figure at £37,270, a great decrease on the November figures, while telephonic exports were somewhat higher.

In the import section, lamps and parts entering this country amounted to over £60,000—this being the highest figure recorded so far. The combined telephonic and telegraphic imports were some £9,000 better than in November. The Argentine, Japan, India and our Australian dependencies were prominent purchasers, Germany and Belgium contributing the greater part of the imports.

Registered Exports of British and Irish Electrical Goods from the United Kingdom.

Country receiving exports and importing.	Electrical goods and appliances.	Wires and cables, rubber and other insulations.	Electric lighting fittings and accessories.	Electric lamps and parts.	Electric meters and instruments.	Electric machinery.	Electrically-driven machinery.	Batteries and accumulators.	Carbons.	Telephonic cable and apparatus and electric bells.	Telegraphic cable and apparatus.	Total.
	£	£	£	£	£	£	£	£	£	£	£	£
Russia, Sweden, Norway and Denmark ...	94	400	125	101	316	7,547	8	8	2,755	41	886	12,281
Germany	318	805	217	279	104	1,306	...	3	15	14	123	3,184
Netherlands	276	162	...	82	15	316	27	4	...	98	110	1,090
Belgium	142	195	19	64	30	1,186	8	15	...	296	240	2,195
France and French Indo-China	454	1,639	113	1,402	5	2,250	3	25	5	8	543	6,447
Portugal, Azores, Madeira & Portuguese Africa	238	10	45	198	10	3,564	3	185	...	14	134	4,401
Spain, Canary Isles and Morocco	185	191	76	192	150	247	...	22	28	9	98	1,198
Italy and Austria-Hungary	170	...	80	82	925	4,073	...	...	...	...	45	5,375
Greece, Turkey and Crete	59	4	37	24	...	602	...	33	...	9	63	831
Channel Isles, Gibraltar, Malta and Cyprus ...	410	59	15	65	17	1,733	...	11	11	8	19,633	21,962
U.S.A., Philippines, Hayti and Cuba	173	50	62	59	35	1,716	...	...	... 10	50	826	2,981
Canada and Newfoundland	80	224	103	51	107	2,852	...	4	...	...	786	4,207
Brit. West Indies, Brit. Guiana & Falkland Is.	28	...	31	25	...	81	...	3	...	11	1,027	1,209
Mexico, Colombia, Eucador, Nicargua and Venezuela	48	169	...	28	...	3,951	...	24	15	22	70	4,327
Peru and Uruguay	190	482	28	20	10	118	...	30	4	...	14	896
Chile	68	713	221	396	...	1,714	25	155	21	84	1,948	5,345
Brazil	741	1,309	494	143	6	3,306	...	2	7	48	3,671	9,727
Argentine	2,909	12,984	92	1,063	371	5,984	...	421	317	3,723	692	28,556
Egypt	78	12	73	65	9	548	...	37	6	276	107	1,211
British West Africa	391	135	103	45	17	42	...	3	7	...	162	905
Cape of Good Hope	340	525	15	75	206	1,456	...	63	16	1,913	58	4,667
Natal	1,082	2,331	36	460	46	6,359	...	100	152	28	30	10,624
Zanzibar, British East Africa, Mauritius, Seychelles and Aden	157	...	67	46	13	96	...	...	5	622	88	1,094
China and Siam	715	195	189	517	31	877	6	28	9	434	449	3,450
Japan	56	6,311	32	21	460	14,521	39	119	...	3,190	799	25,648
Java	10	...	...	...	...	350	...	...	...	...	...	360
India { Bombay	1,643	1,801	568	333	517	9,167	441	568	8	1,309	254	16,729
India { Madras	91	15	70	16	...	2,405	20	...	6	...	...	2,623
India { Bengal	641	3,458	373	821	394	4,995	246	155	198	112	1,940	13,333
Burmah	455	729	...	67	224	1,032	...	...	4	...	9	2,520
Ceylon	102	203	51	54	11	46	...	162	...	48	10	687
Straits Settlements and Fed. Malay States ...	456	1,327	19	48	21	1,414	61	10	9	107	59	3,531
Hong Kong	356	1,303	105	1,376	...	258	...	36	38	...	52	3,524
West Australia	271	40	5	101	15	765	...	3	...	...	39	1,239
South Australia	248	480	109	165	...	2,081	...	88	38	582	146	3,937
Victoria	698	4,667	185	20	357	2,009	...	181	...	3,514	...	11,631
New South Wales	1,234	2,394	426	379	180	7,506	...	2,400	2	4,678	1,032	20,231
Queensland	305	292	11	81	34	249	...	24	...	63	209	1,268
Tasmania	6	...	...	49	70	216	...	21	...	...	...	362
New Zealand and Fiji Islands...	627	2,495	385	208	1,475	5,299	4	365	...	49	918	11,825
Total, £	16,545	48,109	4,603	9,221	6,181	104,337	891	5,308	3,686	21,360	37,270	257,511

Registered Imports into the United Kingdom of Electrical Goods from all Countries.

	£	£	£	£	£	£	£	£	£	£	£
Norway, Sweden and Denmark	6	...	...	163	50	930	...	836	362	£7,710	10,057
Germany	1,855	5,031	593	43,993	19	12,879	850	1,577	3,471	8,813	79,081
Holland	46	2,668	887	7,538	2,153	2,687	50	557	6,357	1,204	24,547
Belgium	1,068	4,603	758	5,258	261	3,895	...	327	1,219	13,612	31,001
France	32	637	330	2,185	1,292	38	...	2,509	2,324	2,458	11,814
United States	2,569	10	839	534	235	8,661	3,321	155	1,303	172	17,799
Total, £	5,576	12,949	3,416	60,071	4,010	29,090	4,221	5,961	15,036	£33,969	174,299

Additional Imports: Italy, machinery, £34; Canada, lamps, £100; Burmah, machinery, £20.

Registered Re-Exports of Foreign and Colonial Electrical Goods from the United Kingdom.

	£	£	£	£	£	£	£	£	£	£	£
Various countries, mainly as above	2,024	157	...	2,775	...	2,376	...	74	607	6,499	...

Total Exports: £257,511. Total Re-Exports: £14,512. Total Imports: £174,453.

Note.—The amounts appearing under the several headings are classified according to the Customs returns. The first and third columns contain many amounts relating to "goods" otherwise unclassified, the latter, doubtless, consisting of similar materials to those appearing in adjacent columns.

Exports and Imports, 1905-8.—With a view to showing at a glance the trend of the export and import trade during the past four years, we reproduce graphically herewith, the totals of the various monthly statements published by us since February, 1905. Reference to this chart will show the extraordinary increase which has taken place in our export business during the last two years It is important to note that the export values here shown, *do not* include any telegraphic cable and apparatus (these returns having only recently become available), while the import values are inclusive of such cable and apparatus.

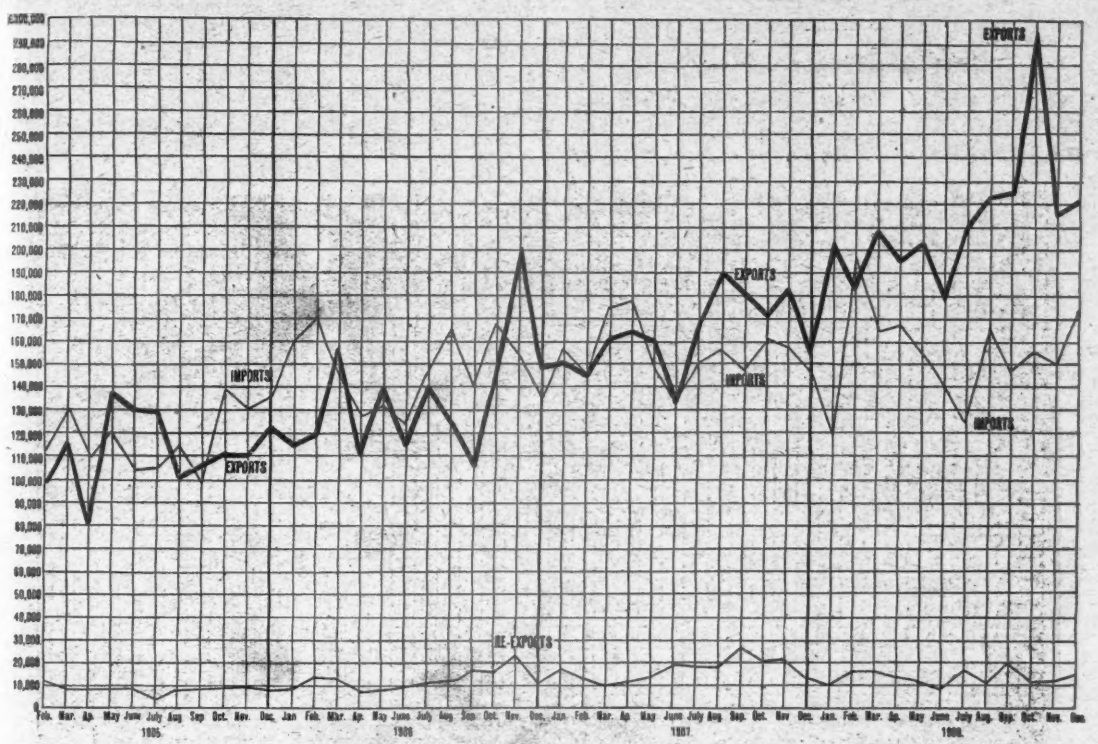

CHART SHOWING THE MONTHLY ELECTRICAL EXPORTS AND IMPORTS DURING THE PAST FOUR YEARS.

Prominent Exports and Imports during 1907 and 1908.—We also show in a similar way the progress of our electrical machinery and cable export business (the last-named being exclusive of telegraph cable), also of the imports of machinery, telegraphic and telephonic material (exclusive of cable) and lamps, &c, during 1907 and 1908. This latter chart shows the remarkable improvement in our electrical machinery exports during the past year, an improvement shown in a less degree by the cable exports.

The imports of electrical machinery, which, in January, 1907, were but little less in value than the exports, show no increase on the average—in fact, a decided falling off is noticeable in recent months. The gradual falling off in telegraphic and telephonic imports is also noticeable.

The most important curve, from the home manufacturer's point of view, is that representing lamp importation. This, it will be noticed, has risen from approximately £15,000 in December, 1907, to £60,000 in December, 1908, the substantial increase in value being, doubtless, due to the large demand for metal-filament lamps from the Continent, and mainly from Germany.

It will be noticed that the curves for cable exports and for telegraphic and telephonic imports end at October, 1908, this being due to the rearrangement of our returns, consequent on the introduction of telegraph exports in November.

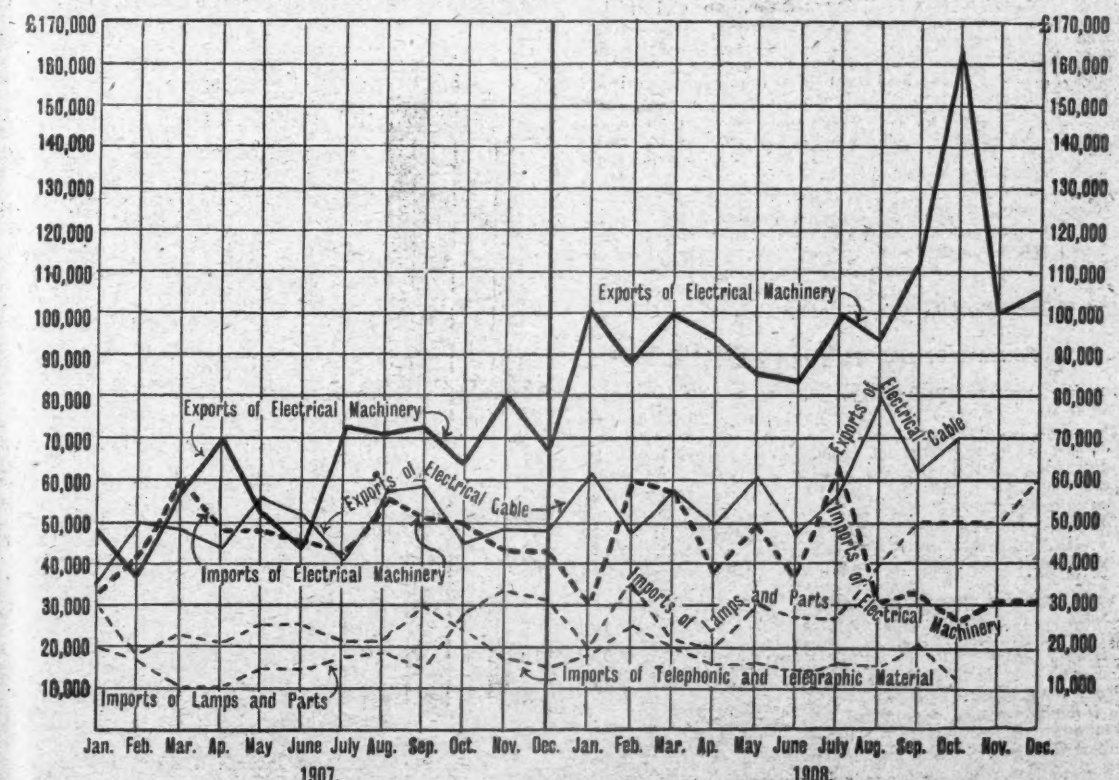

CHART SHOWING THE MONTHLY TOTALS OF THE ELECTRICAL MACHINERY AND CABLE EXPORTS, ALSO OF THE IMPORTS OF ELECTRICAL MACHINERY, TELEGRAPHIC AND TELEPHONIC MATERIAL (EXCLUSIVE OF CABLE), AND LAMPS AND PARTS DURING 1907 AND 1908.

NEW ELECTRICAL DEVICES, FITTINGS, AND PLANT.

Reavell Compressors for Export.

We are always pleased to publish anything which tells of progress that British engineering firms are making in the direction of foreign trade, and the accompanying picture speaks eloquently regarding the doings of Messrs. Reavell & Co., Ltd., of Ipswich. It shows a batch of machines that were sent out by them during December last for foreign work. They were all electrically driven, but there was no room to show the motors and bed-plates as well. Incidentally, it may be mentioned that by far the larger proportion of the compressors constructed by the firm are for electric driving. The first two machines were for an Austrian coal mine, the next eight being for a contract obtained for compressors for the New South Wales Government Railways for rock drilling in connection with a big tunnelling operation, the order having been obtained by Messrs. Reavell's general representatives in Australia, Messrs. Babcock & Wilcox. The other machines appearing in the illustration were also for export. It is satisfactory to note—and one cannot help congratulating the firm upon the fact—that, in spite of the dullness of trade, Messrs. Reavell dispatched more compressors last year than they have ever done before, a very large proportion of them being for foreign orders for mining work.

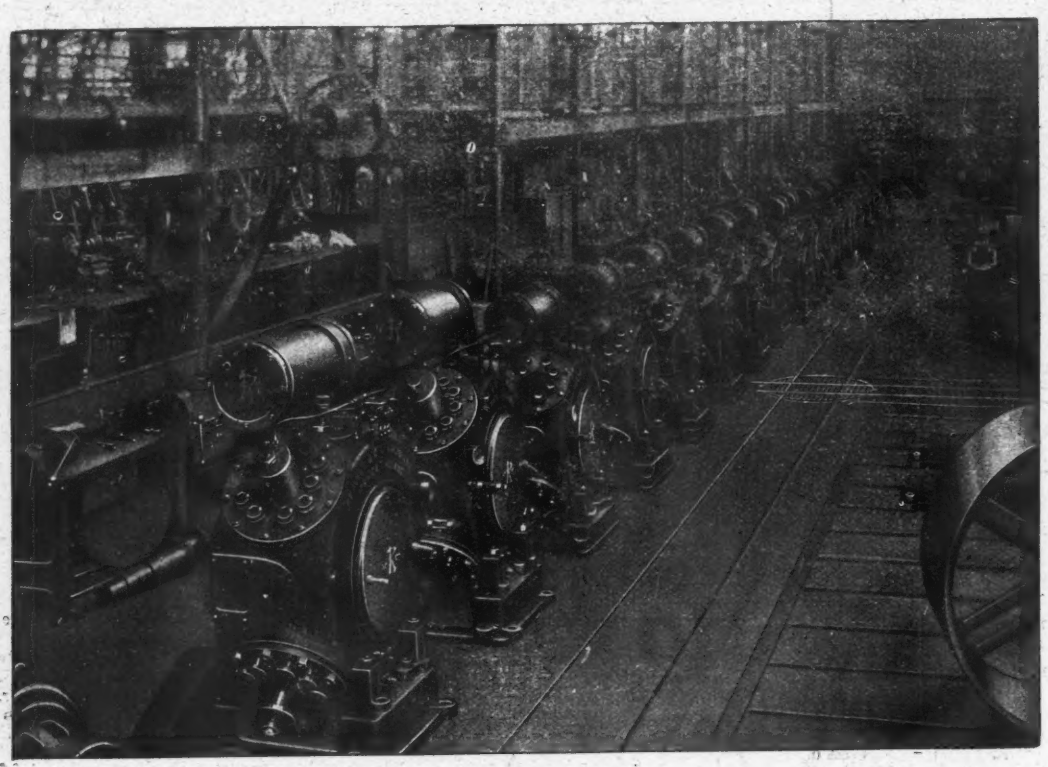

Fig. 1.—A Group of Reavell Compressors for Export.

New Arc Lamps and Brush-holder.

The Westminster Engineering Co., Ltd., Victoria Road, Willesden Junction, are making several types of photographic arc lamps. Their 111 C type is made for burning singly on either A.C. or D.C., with voltages of from 100 to 250. For photographic work it is desirable to get the longest possible steady arc, and for this purpose the lamp is switched on with a comparatively large resistance in circuit, which is gradually cut out till the maximum length of arc is obtained. The current is 14 to 15 amperes on 100 to 120 volts, and 10 amperes on 200 to 250 volts. With alternating current a choking coil is used instead of a resistance.

Type No. 114, which we illustrate, is made for burning singly on pressures of 100 to 500 volts continuous, or 100 to 250 volts alternating. The current is 20 amperes on 100 to 120 volts, 15 amperes on 200 to 250 volts, and 10 amperes on 400 to 500 volts. This lamp is naturally more rapid than the 111 C, and illuminates a larger space. It is largely used for portraiture, kinematograph work and for printing.

Their double-carbon flame arc lamp is a true double-carbon lamp; that is to say, the first pair of carbons are completely burnt out before the second pair are automatically switched in. For 9 to 10 amperes D.C. the carbons are 9 mm. and 8 mm. dia. respectively, and each 18 in. long. For A.C. they are both 9 mm. The burning hours are 11 for each pair of carbons, or 22 hours for the two pairs. The lamp will burn two in series on 100 volts, or four in series on 200 volts, and so on according to voltage. The outside case is of copper, with a 12-in. opalescent globe. In order to protect the points of the second pair of carbons from the heat and fumes from the first pair, a special reflector is used, which forms a separator between the two pairs; the second pair can therefore be so placed that the striking of the second arc extinguishes the first, so that the change-over is hardly perceptible. The lamp burns satisfactorily with ordinary flame carbons, no metal core being required.

The firm also make a carbon brush-holder for dynamos and motors. As shown in fig. 3, this is a box type of holder, in which the spiral spring for putting the necessary pressure on the brush is directly over the centre of the latter. It is entirely enclosed, and so cannot fall off or get damaged; trouble has often occurred in other types due to this spring breaking and falling on the

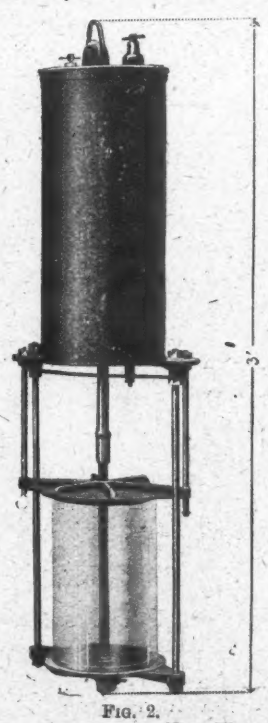

Fig. 2.

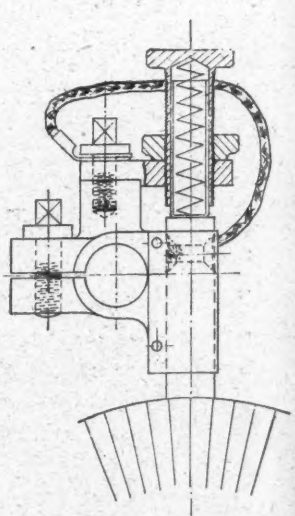

Fig. 3.

New Westminster Devices.

commutator. The brush-holder is simply and strongly made, with no parts likely to get loose. The two screws with square heads are easily got at, and the same key fits both. The pressure on the brush can be adjusted when running if necessary.

Connections to Motors.

The difficulty which is always experienced in properly enclosing the cable connections to a dynamo or motor, in cases where the machine is used in conjunction with a belt drive, and is, therefore, carried upon slide rails for belt-tightening purposes, has been overcome by a simple form of joint box, which, whilst allowing the machine to be moved within the limits of the travel of the slide rails, efficiently metallically encloses the cables at the point of connection to the machine, and at the same time provides a satisfactory method of earthing the casing of the machine.

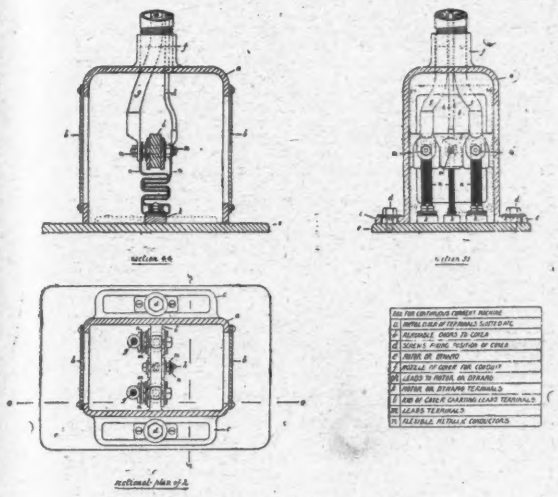

FIG. 4.—DETAILS OF CONNECTION B X.

Fig. 4 shows details of the apparatus as arranged for a D.C. motor. The terminals of the machine are situated at *k* upon some convenient portion thereof, which must, however, be a flat surface. These terminals are completely covered by means of a metal box or cover *a*, which is provided with slots as shown at *c*. These slots, which are kept in position by small blocks forming part of the machine casing, allow the cover to slide either way relatively to the machine by means of set screws, which are shown, together with the blocks referred to above, at *d*.

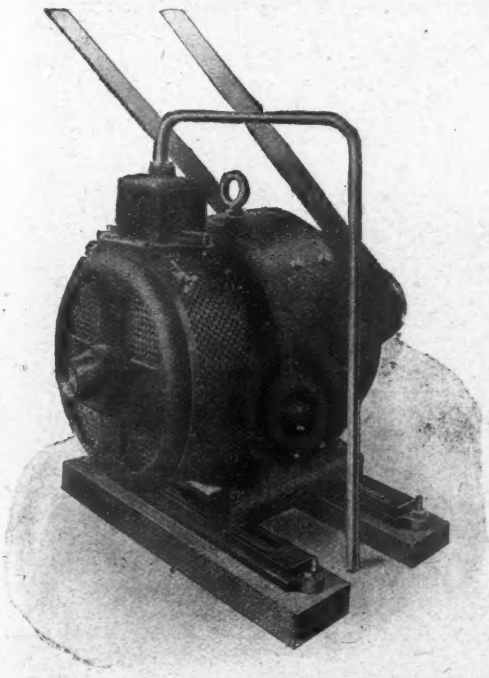

FIG. 5.—MOTOR FITTED WITH CONNECTION BOX.

The cover *a* is provided with removable doors *b*, together with a nozzle to which the tubing carrying the cables to the machine is screwed. The cover is provided with a cast rib. *l*, bushed with insulating material to carry terminals *m*, to which the cables are attached by means of thimbles. The cable terminals *m* are connected to the machine terminals *k* by means of flexible metallic conductors *n*, consisting of flexible braid or thin metal strips.

The conduit being fixed, it is only necessary to release the screws *d*, when the machine can be moved in either direction under the cover until the limit of travel, which corresponds with the limit of travel on the slide rails, is reached.

It will be obvious that the machine will be efficiently earthed through the screw D, of course assuming that the conduit or tubing is properly earthed at some convenient point.

The apparatus is the invention of MR. MACGREGOR DUNCAN, of Westminster, and fig. 5 shows a motor fitted therewith, one of a considerable number used in connection with the electrical equipment of a large boot factory in the Midlands which has been carried out under his supervision, and where, we understand, the apparatus has proved perfectly satisfactory.

The apparatus has been equally successful in connection with three-phase work.

FOREIGN AND COLONIAL TARIFFS ON ELECTRICAL GOODS.

BRITISH INDIA.—The gross weight of goods exported to British India should be marked on packages, and stated on invoices, and as far as practicable the separate value of each package should be indicated. When various descriptions of merchandise are packed together in more than one package, a list of contents of each package should be furnished. Invoices should be certified as correct, and signed by the merchant. It is important that detailed invoices should show the contents of the packages, as this facilitates passing the Customs. Rupee=1s. 4d., or 15 rupees=£1.

The following duties are payable:—

Brass wire	5% ad val.
Copper wire	5% ad val.
Iron pipes and tubes, including fittings therefor ...	1% ad val.
Rails, chairs, sleepers and fishplates, not mentioned below, also spikes, crossings, lever boxes, clips and tie bars	1% ad val.
Iron beams, joists, girders, bridge-work, &c., imported exclusively for building work ...	1% ad val.
Iron wire, including fencing wire and wire rope ...	1% ad val.
Steel plates above ⅛ in. thick, 1% on value of 110 rupees per ton.	
" up to " " " 125 "	
Steel shutes (other than corrugated) if galvanised, tinned, lead coated, chequered or planished	1% ad val.
Steel sheets, corrugated, galvanised or black	1% on value of 200 rupees per ton.
Steel pipes and tubes, including fittings therefor...	1% ad val.
Steel wire, including fencing wire and wire rope ...	1% ad val.
Building and engineering materials, viz., asphalt, bricks and tiles, cement of all kinds, earthenware, piping, lime, and other kinds not otherwise described	5% ad val.
Coal, coke and patent fuel	free.
Earthenware (except earthenware piping), china, china clay, porcelain, &c.	5% ad val.
Pitch, tar and dammer...	5% ad val.

The following are free:—

Machinery, viz., prime movers and component parts thereof, including boilers and component parts thereof; also including locomotive and portable engines, steam rollers, fire engines and other machines in which the prime mover is not separable from the operative parts.

Machinery (and component parts thereof), viz., machines or sets of machines to be worked by electric, steam, water, fire or other power not being manual or animal labour, or which, before being brought into use, require to be fixed with reference to other moving parts,

NOTE.—It is provided that the term "machinery" does not include tools and implements to be worked by manual or animal labour; also that only such articles shall be admitted as component parts of machinery as are indispensable for the working of the machinery, and are, owing to their shape or to other special quality, not adapted for any other purpose.

Belting of all materials for machinery.

Machinery and component parts thereof made of substances other than metal are included under the above heading.

Railway rolling stock, viz.: turntables, weighbridges, engines, tenders and traversers; also cranes and water cranes when imported by or under the orders of a railway company.

NOTE.—It is provided that for the purpose of this exemption "railway" shall mean a line of railway subject to the provisions of the Indian Railways Act, 1890, also including railways constructed in Native States under the suzerainty of His Majesty.

Dynamos, accumulators, motors, electric fans, and similar machinery, including component parts thereof; electrical apparatus and appliances imported by passengers in the exercise of a profession or calling, for their own use and as part of their personal baggage.

Telegraph instruments and apparatus (including tapering iron pipes for telephone posts):—

Imported by, or to the order of, a railway company	free.
All other	5% ad val.
All other electrical and similar materials	5% ad val.

Unless otherwise stated, the value on which duty is levied is the wholesale value of the goods at the place of import, less trade discount.

NEW PATENTS APPLIED FOR, 1909.

Compiled expressly for this journal by W. P. THOMPSON & Co., Electrical Patent Agents, 322, High Holborn, London, W.C., and at Liverpool and Bradford, to whom all inquiries should be addressed.

696. "Improvements in or relating to electric current counters or meters." A. ZIPPLES. (Date applied for under Sec. 91 of the Act, January 18th, 1908, being date of application in Germany.) January 11th. (Complete.)

641. "Improvements in or applicable to ammeters and the like." R. E. MEADE. January 11th.

667. "Improvements in and relating to metal-filament lamps." J. MESZAROS. January 11th.

687. "Improvements in pendulum electricity meters." C. FERY. January 11th. (Complete.)

693. "Improvements relating to dynamo-electric machines." M. WALKER. January 11th.

694. "Improvements in and relating to alternating current dynamo-electric apparatus." BRITISH THOMSON-HOUSTON CO., LTD. (Allgemeine Elektricitäts Ges., Germany.) (Application for Patent of Addition to No. 23,288/02.) January 11th. (Complete.)

695. "Improvements in and relating to the control of electrically-operated clutches." F. M. GREEN and DAIMLER MOTOR CO., LTD. January 11th. (Complete.)

700. "Improvements in and relating to socket holders for electric lamps." W. K. L. DICKSON. January 11th.

727. "Improvements in or relating to the mouthpieces or recording trumpets of gramophones, phonographs and telephones." R. MACDONALD. January 12th.

738. "New electric motor." E. HOLZHAUER. January 12th.

747. "Improvements relating to trolleys for electrically-driven vehicles." S. BRYAN. January 12th. (Complete.)

758. "Improvements in and relating to electric motors especially applicable for driving sewing machines and the like." W. E. LAKE. (F. Bissel Co., United States.) January 12th. (Complete.)

759. "Improvements in apparatus for controlling electric motors." H. E. DEY. January 12th. (Complete.)

764. "Improvements in or relating to trolley-arms for electric traction systems." E. M. MUNRO and RAILLESS ELECTRIC TRACTION CO., LTD. January 12th.

769. "Improvements in secondary batteries or accumulators." L. DE M. MARQUES. January 12th.

786. "Improvements in and relating to alternating-current dynamo-electric apparatus." BRITISH THOMSON-HOUSTON CO., LTD. (Allgemeine-Elektricitäts-Ges., Germany.) (Application for Patent of Addition to No. 23,288/02.) January 12th. (Complete.)

803. "Improvements in electric hand lamps." H. J. FULLER. January 13th.

837. "Improvements in electrical heating apparatus." R. G. FANE and F. L. NEWHOUSE. January 13th.

843. "Improvements in the supports of overhead electric cables and the like." G. H. BOWDEN, F. C. ANDERSON and C. A. ATCHLEY (trading together as G. Harland Bowden & Co.), and G. BULL. January 13th.

875. "Improvements in means for supporting electric lamps." J. H. MCLEAN. January 13th.

893. "Improvements in or relating to apparatus for collecting current in connection with electric traction." E. W. L. NICOL. January 13th.

972. "Automatic locking device especially applicable to water, steam, gas, or other fluid cock plugs, electric switches and the like." H. A. LIVERMORE and H. W. BROWNING. January 14th.

977. "Improved arrangement of winding for electromagnets and the like." H. LAMPMANN (C. Engel and O. Schröder, Germany). January 14th.

984. "Improvements in electrical apparatus for controlling the sighting of guns." A. T. DAWSON and G. T. BUCKHAM. January 14th.

986. "Improvements relating to telephone service meters." O. C. DENNIS. January 14th. (Complete.)

1,009. "Improvements in the attachment of telegraph and similar line-wires to insulators." W. E. BANDFIELD. January 15th.

1,019. "Improvements relating to public vehicles, such as electric tramcars, railway vehicles, motor-'buses, and the like." C. W. MALLINS. January 15th.

1,029. "System for maintaining the circuit of electric lamps burning in series on failure of one or more such lamps." N. R. BOOTH and J. HAMER. January 15th.

1,031. "Improvements in and connected with axle-boxes of electrically-propelled cars running on rails." G. J. CONATY. January 15th.

1,043. "Improvements in and relating to switches for tramways." N. SCHWARZ and M. GRIESS. January 15th. (Complete.)

1,067. "Improvements in or relating to electric traction systems." E. M. MUNRO and RAILLESS ELECTRIC TRACTION CO., LTD. January 15th.

1,070. "Improvements in apparatus for generating high continuous potential differences." J. DELON. (Date applied for under Sec. 91 of the Act, January 17th, 1908, being date of application in France.) January 15th. (Complete.)

1,077. "Improvements in or relating to trolley-heads for electrically-propelled vehicles." E. M. MUNRO and RAILLESS ELECTRIC TRACTION CO., LTD. January 15th.

1,078. "Improvements in or relating to electric traction systems." E. M. MUNRO and RAILLESS ELECTRIC TRACTION CO., LTD. January 15th.

1,086. "Improvements in and relating to the electric control of lifts." J. G. CHILDS and T. S. HILL. January 15th. (Complete.)

1,092. "Improvements in electric accumulator sub-stations." A. M. TAYLOR (Date applied for under Rule 13, November 29th, 1907. An invention comprised in application No. 26,381, dated November 29th, 1907.) January 15th.

1,182. "Improvements in flashing mechanism for electric signs and the like." H. JENNER. January 16th.

1,186. "Improvements in and relating to electrolytic cells." H. W. BRADLEY and H. N. BICKERTON. January 16th.

1,157. "Improvements relating to devices for automatically regulating the voltage of electrical machines." O. ANDRE. January 16th.

PUBLISHED SPECIFICATIONS.

Copies of any of these Specifications may be obtained of Messrs. W. P. THOMPSON & Co., 322, High Holborn, W.C., and at Liverpool and Bradford; price, post free, 9d. (in stamps).

1908.

ELECTRICAL WATER HEATERS. E. I. Rains. 15,876. July 20th.

TELEPHONE CORDLESS SWITCHBOARDS. W. Aitken. 15,818. July 25th.

ELECTRIC MAKE-AND-BREAK DEVICES. T. J. Rorke and E. Rorke. 15,949. July 27th. (Post-dated July 27th, 1908.)

PREPAYMENT ELECTRIC METERS. E. Schattner and R. Amberton. 16,910. August 11th. (Date applied for under Rule 13, March 17th, 1908.)

MANUFACTURE OF ELECTRIC INCANDESCENCE BODIES OF TUNGSTEN. Siemens and Halske Akt.-Ges. 19,311. September 14th. (Date applied for under International Convention, September 26th, 1907.)

SWITCHING APPARATUS FOR INTERCONNECTING THE LINES OF A TELEPHONE EXCHANGE SYSTEM. J. E. Kingsbury. (Western Electric Co., United States.) 197. January 3rd.

FRICTION BLOCKS, SUCH AS BRAKE BLOCKS, ELECTRICAL COLLECTOR, SLIPPERS AND THE LIKE. C. C. W. Simpson. 1,178. January 17th.

PREPAYMENT ELECTRICITY METERS. G. Hookham and S. H. Holden. 2,769. February 7th.

RAILWAY POINTS OR SWITCHES. W. R. Jenney. 3,401. February 14th. (Date applied for under International Convention, February 14th, 1907.)

ROTARY ELECTRIC TRANSFORMERS AND MOTOR-GENERATORS. Crompton & Co., J. C. Macfarlane and H. Burge. 3,626. February 18th.

MANUFACTURE OF INCANDESCENT BODIES FOR ELECTRIC LAMPS. F. J. Planchon. 4,966. March 4th.

LUBRICATION OF THE JOURNALS OF ELECTRIC MOTORS AND TRAMWAY AXLES AND THE LIKE. C. H. Stone and E. S. Quilliam. 6,750. March 28th.

ELECTRICAL MACHINES OR THE LIKE. B. Ljungström. 6,955. March 28th. (Date applied for under International Convention, April 12th, 1907.)

TELEPHONE RELAYS. British Thomson-Houston Co. (General Electric Co., United States.) 7,730. April 7th.

GLOBE GALLERIES FOR GAS-BURNERS, ELECTRIC LAMPS AND THE LIKE. S. Mundler. 7,740. April 7th.

CONNECTORS FOR ELECTRIC CONDUCTORS. A. Morgan. 7,853. April 9th.

CONTINUOUS-CURRENT MACHINES. Siemens Schuckertwerke Ges. 11,517. May 27th. (Date applied for under International Convention, July 27th, 1907.)

ELECTRICAL RESISTANCES ADAPTED TO MEASURE CURRENTS BY THE FALL-OF-POTENTIAL METHOD. Evershed & Vignoles, Ltd., and E. B. Vignoles. 12,296. June 6th.

ELECTRO-MAGNETIC CLUTCHES. Siemens Bros. Dynamo Works. (Siemens Schuckertwerke Ges.) 16,766. August 10th.

ELECTRIC ARC LAMPS. T. J. Rensing. 16,797. August 10th.

MAGNETO MACHINES FOR USE IN CONNECTION WITH THE IGNITION SYSTEMS OF INTERNAL-COMBUSTION ENGINES. R. F. Hall. 16,848. August 11th. (Date applied for under Rule 13, July 20th, 1908.)

RECEPTACLES FOR SCRAP TIN OR THE LIKE FOR ELECTROLYSIS. London Electron Works Co. and A. de Back. 17,115. August 14th.

COOLING OF THE END WINDINGS OF DYNAMO-ELECTRIC MACHINES. Siemens Bros. Dynamo Works, Ltd. (Siemens Schuckertwerke Ges., Germany.) 17,416. August 19th.

ARC LAMPS. Allgemeine Elektricitäts Ges. 17,535. August 20th. (Date applied for under International Convention, August 21st, 1907.)

MEANS FOR THE CONSTANT DISINFECTION OF SPEAKING TUBES, TELEPHONE MOUTHPIECES OR THE LIKE. G. W. Gibberd and O. A. Elias. 17,612. August 21st.

ALTERNATING-CURRENT ELECTRIC ENERGY INTEGRATING METERS. R. Kennedy. 17,730. August 24th.

AUTOMATIC TELEPHONE EXCHANGES. J. A. Palmborg. 17,934. August 26th. (Date applied for under International Convention, September 3rd, 1907.)

MEANS FOR PRODUCING ELECTRIC ENERGY. J. H. Reineke. 17,986. August 26th.

ELECTRIC FURNACES. A. le Roy Marsh. 19,265. September 14th. (Date applied for under International Convention, September 19th, 1907.)

ELECTRIC FURNACES. C. A. Keller. 21,741. October 14th.

Imperial International Exhibition, 1909.—This Exhibition is to be held at the "Great White City," Shepherd's Bush, this year. An interesting booklet and prospectus has been issued by the General Committee. We learn that special effort is being made to assemble in the Mechanical and Civil Engineering Section a good display of producer gas plant and applications thereof to power gas engines and industrial heating furnaces; oil and petrol engines; motor-driven vehicles, boats and aeroplanes; steam boilers, engines and turbines; marine, mining and agricultural machinery; steam power accessories; metal and woodworking machine tools; refrigerating and air compressing plant; working exhibits of labour-saving and trade process machinery of as many kinds as possible; water and gas works equipment; lighting apparatus; railway and contractor's plant and appliances; metallurgical and chemical process plant and products; concrete making and handling machinery; concrete systems and methods of construction; various utilisations of cement and other materials; building and civil engineering exhibits.

"The Grissonater."—Referring to this device, which was described in our issue of January 8th, Messrs. Isenthal & Co. have drawn our attention to the fact that this identical apparatus was shown by them under the name of Grisson Resonator at the Royal Society Conversazione in May, 1905, and was commented upon in our issue of June 2nd, 1905, and in a letter of June 2nd from themselves. The arrangement, therefore, is not a new device. Although at one time Messrs. Isenthal supplied a good many such installations, they have discontinued doing so owing to the difficulty experienced in keeping the capacity of the electrolytic condensers then used anything like constant, and also because on high voltages, such as 200 to 250 volts, the multiplication of electrolytic condensers required to cope with this higher pressure complicated the apparatus very greatly.